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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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WORK WORLD.

PNEUMATIC mail transportation through wrought-iron tubes is becoming general in America.

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The total cotton crop of the world for 1891 is estimated at 12,570,000 bales, averaging 400 lb. weight.

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An electrical cigar-lighter is the latest scientific novelty. It is likely to find favour on the counters of retail tobacconists, etc.

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Philadelphian steamers are busy loading oil for France. Encouraged by the low prices the oil refinery business is growing apace.

* *

The Indian wheat crop of 1892 is officially reported to be 5,422,000 tons—the smallest since 1884.

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Skilled workmen who arrive in America from Europe are returned under the law prohibiting the importation of contract labour.

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We hear of the invention of an electric locomotive capable of travelling at a rate of 123 miles per hour. We look with interest for the actual trial results.

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A newly invented cotton-picking machine does as much work in two hours as an average farm hand in a week. The hardest problem in cotton-raising is thus solved.

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While the London, Brighton and South Coast Railway are extending the electric lighting in their trains, some of the Northern lines are abandoning it and reverting to older methods of illumination.

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A new steel vessel, built at Barrow, for the carrying of oil in bulk, is pronounced to be the finest sailing craft that ever entered the Delaware. She carries about 850,000 gallons of petroleum.

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A Spaniard has invented a pneumatic tube for the submarine transmission of letters, by which a letter deposited in the tube at Rio de Janeiro would arrive in Europe during the same day. No details, however, are given to show how the air friction in a small tube of such length is dealt with.

The largest power dam ever built in America is now being constructed across the Colorado River at Austin, Texas. It is intended to utilise the power of the river for electric lighting, railways, water pumping, and factories. When completed, it will be 1,150 ft. long, 60 ft. high, and 18 ft. wide at the top. The up-stream face is vertical, and built in limestone; the down-stream face is of Texas granite, and the interior is of rubble masonry of small stone and cement.

* *

The tallest wrought-iron chimney in Great Britain has been erected at Darwen, in Lancashire, for carrying off blast-furnace gases. The total height, including foundation, is 275 ft. The weight of ironwork is 114 tons 7 cwt., and 17,000 rivets have been used to connect the plates. It is steadied by twelve foundation bolts, each 16 ft. 3 in. long by $2\frac{1}{2}$ in. in diameter. The brick lining is 18 in. thick at the bottom, and 3 in. thick at the top. The base-plate is 27 ft. 6 in. in diameter.

* *

A new lighthouse has been erected at Douglas Head, Isle of Man. The lantern which crowns the tower is 9 ft. in diameter and 7 ft. 3 in. in height. It has a four-wick burner, which consumes eighteen gallons of paraffin per hour, giving a light of 288 candle-power. The apparatus makes one revolution in thirty seconds, the result being that six beams of light, following each other in rapid succession, are shown during a period of fifteen seconds, succeeded by a period of darkness for fifteen seconds.

* *

An extensive deposit of kerosene shale has been found at Capertee, New South Wales. The shale yields, on distillation, an average of 150 gallons of crude oil per ton, which latter gives over 60 per cent. of refined kerosene oil, the remaining products being gasoline, benzine, spongaline, paraffin, lubricating oil, and creosote oils. Its gas-producing capabilities are 18,000 cubic feet of gas per ton, with an illuminating power of thirty-eight to forty candles. The shale is, therefore, valuable, as it can be mixed with poor coal for the manufacture of illuminating gas.

* *

An invention that looks well on paper, but might prove dangerous in practice if entire reliance were placed upon it, is the automatic brake for road vehicles of M. Jules des Georges. Instead of tightening the brake on the wheel, the driver has only to exert an effort through levers, rods, and the articulated brake-shoe, to bring the block into contact with the rim of the wheel, the rotation of which tightens the block through drawing it along a groove in the shoe. A spiral spring in the shoe brings back the block when pressure is removed.

* *

Cellulose is being used as a protecting shell for bottles, in place of the straw coverings commonly employed. Sheets of common cellulose are stamped with small oval indentations, about 1 in. long by $\frac{1}{2}$ in. wide; they are then cut into strips the height of a wine bottle, and long enough to go twice round it. These are rolled round the bottles so as to form a double covering, and fastened at the top and bottom with metal sprigs. A bottle so packed can be thrown on the floor without breaking. Space is saved in packing, as the cellulose takes up less room than straw; it is also cleaner.

* *

In a new method of photographing the sound of vowels, the vowels were sung out before one of Edison's phonographs. Immediately afterward they were reproduced very slowly, and the vibrations recorded by a microphone. The latter was furnished with a mirror, which reflected the light of an electric lamp upon a registering cylinder covered with sensitised paper, and protected by another cylinder with a small opening, which gave passage to the rays of light from the reflector. By this means was obtained very distinct photographic traces, and the constancy was remarkable for the different letters.

* *

An interesting collection of English tramway and railway rails of the earliest and latest types—from 1767 to 1892—has been forwarded to the Chicago Exhibition. Amongst others are sections of cast-iron rails laid in Wales in 1767, upon which locomotives ran in 1804; edge rails laid in 1879 in Loughborough; edge rails laid in 1793, and used continuously for ninety-nine years, presented by the Duke of Rutland; wrought-iron rail laid in cast-iron chairs at Swannington in 1820; and a specimen of the Liverpool and Manchester Railway rail on which was made the famous locomotive test which resulted in the victory of Stephenson's "Rocket."

BOOT AND SHOE MAKING.

BY WILLIAM GREENFIELD.

STITCHING, AND THE ACTION OF THE STITCHING AWL—THE WAY THE CHANNEL IS LAID DOWN—HOW TO FIX THE SOLE-PIECE ON—THE WAY TO MAKE THE SPLIT-LIFTS—THEIR PROPER PLACE IN THE HEEL.

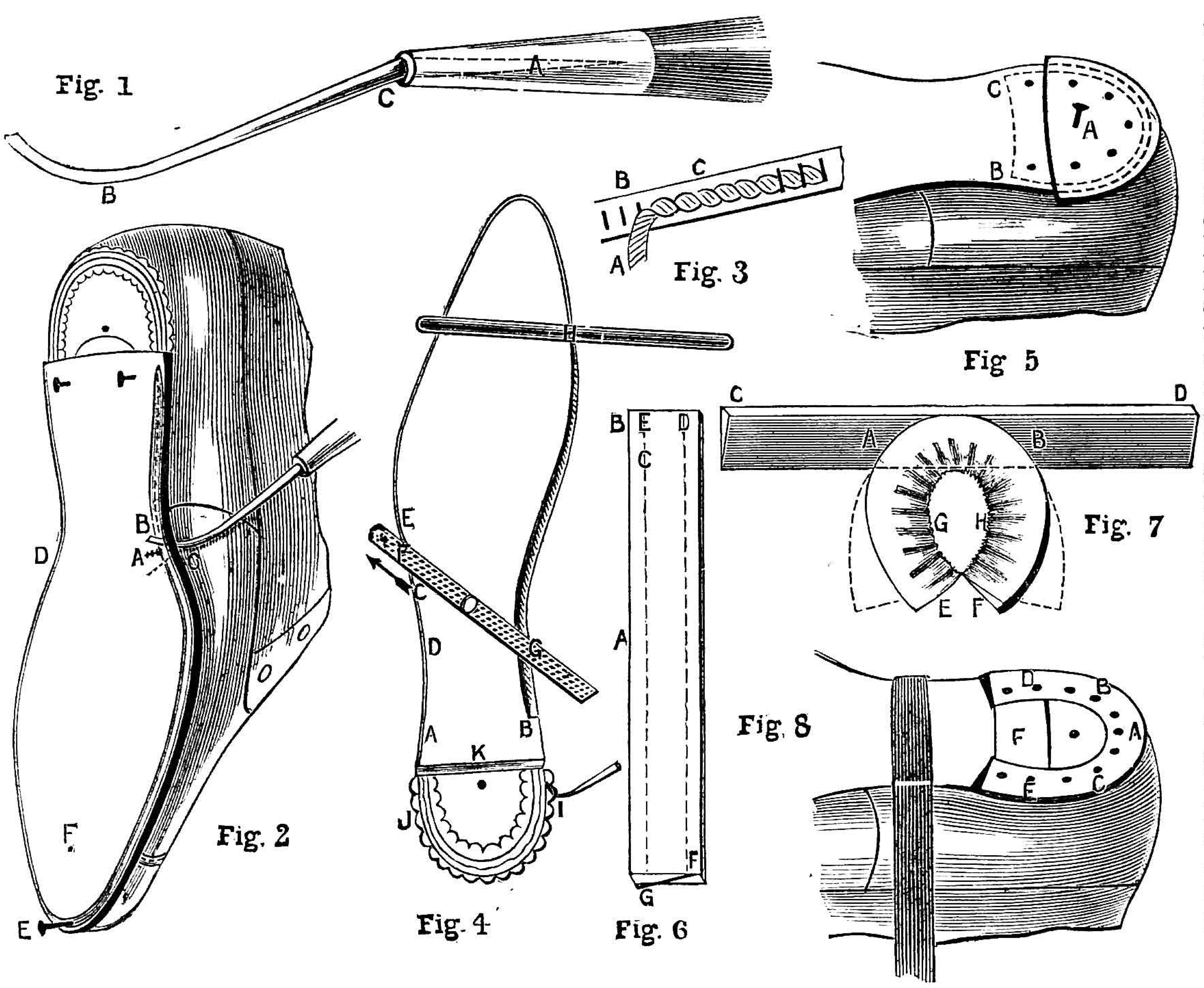
Stitching, and the Action of the Stitching Awl.—Previous to commencing to stitch, run the fudge wheel round the welt. This will make an impression upon it somewhat like a stitch ; then while stitching—if the awl be carefully put into each mark of the wheel—you will be able to set a nice, regular stitch.

In making a boot for your own feet, you need not necessarily stitch the waist, or even the fore-part. It is, however, better to do so, since it makes the work so much more solid. Anyway, should you wish to sew them, either for quickness or because you find at first any difficulty in using the stitching awl, you will find the seam will be made much stronger by using a small sewing awl, the side of which you have rubbed off a little on the emery stick.

Stitching is the stronger, because you can get the stitches closer together than in sewing, and, owing to the shape of the awl and the way it is used, a much smaller hole is made.

Before putting the awl in for the first time, place the strap over the left knee and waist of the boot. The boot should lay on the lap while the legs, or knees, are held quite firmly together : the toe must be towards you, with the upper to the right and the sole to the left, when, with the thumb-nail of the left hand, the channel can be opened for about 2 in. This is to prevent the awl from cutting or notching the thin piece of grain which was cut up to form this channel. This, if cut about, would become very unsightly when laid down and finished.

It will be seen by Fig. 1 that the stitching awl is put into a similar handle to the sewing awl, only it is a little smaller. It is an instrument made like the sewing awl, but the point is flat the reverse way, and more square ; in fact, it is often called a square awl. It is constructed so that when it is in the handle, as seen at A, the point shall have a certain drop or pitch, as at B to C. This makes it handy to get into awkward places, and, by pressure on the handle, a power is secured which it would otherwise be hard to obtain. The action of this awl is peculiar. It must not be wriggled, as the sewing awl is, but passed right through by one rapid and almost straight jerk, the boot being held exceedingly firm, or the awl will break.



Boot and Shoe Making. Fig. 1.—Stitching Awl, showing how it is put into Handle. Fig. 2.—Section of Boot, illustrating how the Channel is cut, and how and where the Boot is stitched. Fig. 3.—The way the Stitch is thrown and pricked up. Fig. 4.—Showing how the Channel is laid down and the Seat Stitch picked out. Fig. 5.—The Method of splicing and putting Seat Piece on. Fig. 6.—How the Split-lifts are split. Fig. 7.—The way they are turned. Fig. 8.—Their place in the Heel.

Now, assuming you have stitched or sewn the waist, let us see how to stitch the fore-part, this being the point where you set the fudge on the welt. The left thumb is pressed against A (Fig. 2), just beyond where the awl is coming out, as shown by B. The awl is laid on the upper, as seen at B (Fig. 1) and C (Fig. 2), with the point against the flat of the welt. It must then be pushed through by one sharp push, just dropping the elbow while doing so, sending the point through to the other side of A, and seeing that it comes out quite in the pit of the channel. Then it must be pulled out just as quickly, and in the same way, but this time raising the elbow while doing so.

The way the stitch is set depends, to some extent, upon whether the work is to be "pricked up," "fudged," or left plain, which is called a "blind-welt," or the stitch sunk in order that the welt may be fudged to imitate stitching. For the two former, the stitch will have to be set up boldly by over-casting the stitch, and by letting the end of the thread in the right hand pass under the stitch during the whole time it is being set, as at A (Fig. 3), until it is finally pulled to the same tension as the other stitches.

The three perpendicular lines at B show the mark of the fudge wheel, and where the awl is to be put in each time. The part at C is left plain to show how the stitch is each time thrown the same way.

If the stitch is to be left plain, the stitch and thread can have the reverse action, and so much care need not be taken with it. I would say, however, always try your hand at the stitch shown in Fig. 3, since, as it wants learning, this is the best place to get the practice. If you require to sink the stitch in order to fudge it, take the sewing awl and lay it on the upper as though you were going to sew. With the point just against the welt, draw it the whole way round the welt from C to D (Fig. 2), letting it cut a channel in the welt just the depth of the grain, and precisely in the same place as where the stitches are to be set.

You can now go on with the stitching, opening the channel with the left thumb-nail at about every inch or so, at the same time not forgetting to put a little wax on the thread on the left side. This process you continue the whole way round, pulling the nail at E out when you come to it. It will be seen that it is placed in the channel to prevent a mark or hole at F, where the tack is generally put, and a peg, or piece of leather, is added afterwards to fill up.

The Way the Channel is Laid Down.—After the boot is stitched, the stitches that lay in the channel must be rubbed down the whole way round with a piece of bone, and then a little paste is applied here and there, and rubbed in, so that there is a thin, uniform coat all round inside the channel. This is done by placing a piece of old soft rag over the right thumb, and putting the nail in the channel and rubbing it up and down the channel from one end to the other. The boot is held between the knees, heel towards the worker, and the channel is lightly laid down by passing the smooth side of an old file over it from A to B (Fig. 4), holding the file one end in each hand, and taking strokes from A to C, and D to E, and so on. Give the file an outward direction, as indicated by the arrow, by starting at F, on file, and finishing at G. This will throw the narrow margin of grain—made in the cutting of the channel—over the edge as a burr. This is thrown back again by the action of the back of the knife on the edge of the sole, as was done with the file on the top. Then the boot is turned round, and the knife is held in the right hand and the boot in the left, the blade of the knife being flat on the sole. In this position it is passed round to cut off this burr level with the top of the sole. The sole is then slightly damped entirely over, and rubbed down with a long-stick—a piece of round boxwood about a foot long, made very smooth by rubbing with fine sandpaper. The sole is worked down by well rubbing first the seam all round as at H, and the centre afterwards. It must be passed over the leather briskly, but not so much as to generate heat and so injure the grain. For this process the boot has to be held firmly between the knees, using the long-stick, one end in each hand, as the file.

Each end must be at right angles with the channel, and the rubbing done with the centre of it, as at H. When this is accomplished, and the bottom is smooth, the stitches on the welt can be very lightly rubbed down with the bone, and the sole also hammered all over until it is perfectly even. For the waist a round-headed hammer is necessary, this part being nicely hammered.

How to Fix the Sole-piece.—The point of the sewing awl is dipped into a piece of soap so that the wax of the thread will not stick to it. It is then passed under the stitch of the rest as at I. It must not be put through very far, only sufficiently to make the stitches, that were tight before, just lay a little way from the upper, as at I, J. The edge of the sole, at the end, K, is filed a little to throw the grain up and make it smooth, and the piece of leather that is to make the sole-piece must be cut straight at one side, and filed in a way shown at K. These two ends are pasted and put together, and a nail is placed as at A (Fig. 5), with about five pegs driven in, and two in the sole, as indicated by the dots on top. The piece then wants paring up at the dotted line to the shape required, leaving plenty of stuff all round to cover the stitch. It should overhang the stitches about a quarter of an inch, not more. A little angular piece must now be taken off round to the second or inside dotted line, and for about a third or bare half of the substance of the leather. The nail is drawn out, and the tops of the pegs taken off, at the same time cutting away the grain of the leather quite round them: in fact, from the whole of the top, from B to C, being careful to take most away where the pegs are fixed. These should be half an inch from the edge all round, and when the cutting away has been done it can be rasped to make it rough, though fairly level.

The Way to Make the Split-lift.—The split-lifts are made from a piece of butt leather, generally first-cut, as, while it requires to be tight, it must at the same time be supple. The leather should be about 7 in. long, and say 1 in. wide. Such, with splitting down the centre while quite wet, makes a pair. The splitting is done as follows:—Place the leather on a board, grain side up, and while the board is on the knees, put the left hand upon the board, letting the thumb rest at A and the little finger at B (Fig. 6). With the first, second, and third fingers press very hard upon the leather (to keep it firm on the board), as at point C. The knife is then held in a slanting position, so that when it is put in at D, on top, it will come out at E on the other side. In this way the knife is drawn along the dotted line, D, until reaching F, bearing in mind that the point must come out on the other side along the dotted line, C, to A. Then you secure two pieces of leather, as A B (Fig. 7), which should be quite wedge-shaped, as shown. If you have not succeeded in this while splitting, you must trim them up afterwards. One is then laid on the lap-iron with the thin edge towards the worker, as shown in the diagram. The left thumb is placed upon A, and the right upon B, with thumb-nails towards you, the hands back to back, and the two forefingers against C and D. In this way the thumbs can be pressed very hard, and the two ends brought round to E and F. This will make the thin edge pucker up in the centre, as G and H, but these are hammered down flat by tapping down round the centre while you hold the two ends between the thumb and finger of the left hand. Thus one split-lift is made, and the process must be repeated for the other.

Although the split-lifts must be cut (or split) while wet, it is best to let them dry a little prior to blocking them on the lap-iron. When this is done, you will find that in drying they open a little at the ends, as shown by the dotted lines. For this reason the ends are held together in order that they may dry the proper shape.

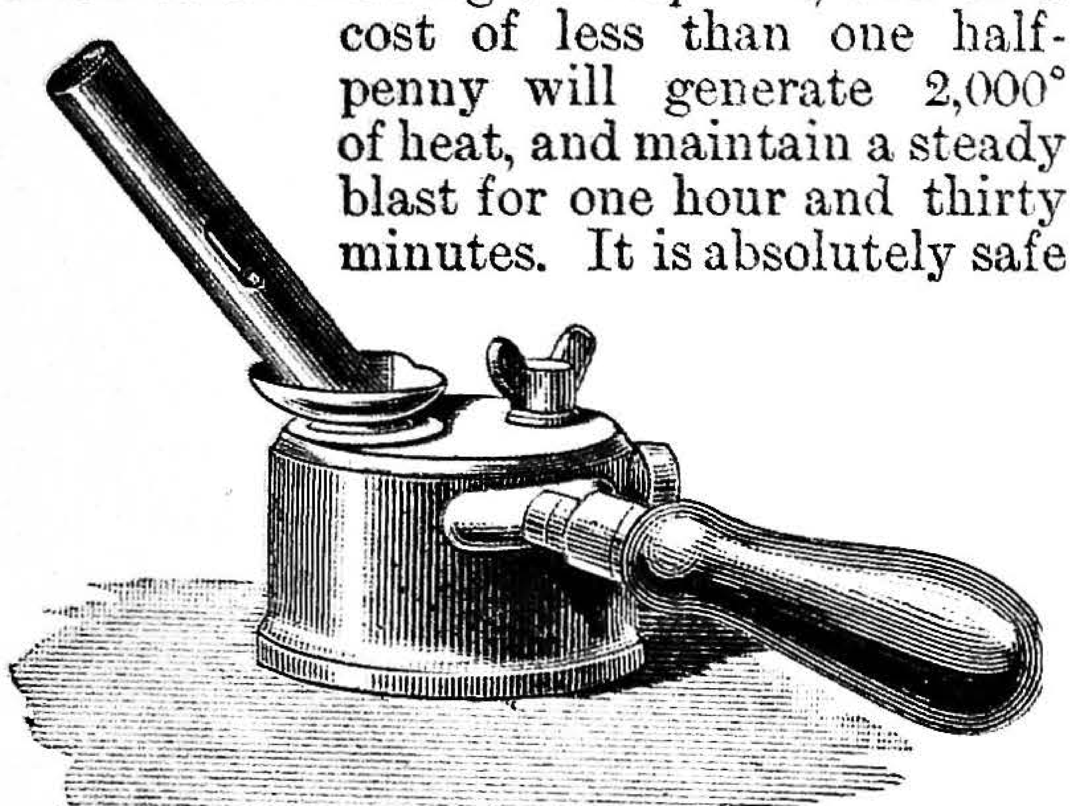
Their Proper Place in the Heel.—The heel, as you left it in Fig. 5, was rasped off and made rough. This is done so as to receive a thin coat of paste all round the same width as the split-lift, which is rasped on one side and treated similarly. It is then put on the sole, as shown in Fig. 8, the boot being held firmly on the knees by the strap passing over the waist and between the knees, while the heel end is on the right and the toe on the left knee.

The edge of the split-lift is fixed just flush with the edge of the centre of the seat-piece at A, and a peg driven in. Another is put in at B, and one at C, then one at D, and another at E. This will keep it in its place while another is put in between each of these, but they must all be placed as far away from the edge, or as near the centre, as the thickness of the split-lift will admit.

It is then nicely pared round. The outside corner (if a gent's, or lady's square heel boot) should be left square, while towards the back and inside corner it can slant in somewhat. Then the tops of the pegs may be cut off and the top rasped as was the seat; also remove the two ends just over the mark, F. In doing so, slip a piece of zinc under the end previous to cutting, so that you do not cut the grain of the sole in the process.

VULCAN TORCH.

For artisans the vulcan torch, as illustrated herewith, will be found useful—if they can get it imported from America. It is referred to as burning 76° naphtha, and at a cost of less than one half-penny will generate 2,000° of heat, and maintain a steady blast for one hour and thirty minutes. It is absolutely safe



Vulcan Torch.

and extremely simple, little likely to get out of order, and can be taken apart and carried in the pocket. It has proved invaluable to railroad men, coppersmiths, tinsmiths, plumbers, gas-fitters, carriage and waggon builders, machinists, and constructors of electric subways, etc. It is, too, unequalled for burning off paint.

WHEN electric light mains of uncovered copper are laid in underground culverts, the wires should be stretched taut over the best quality insulators placed 14 yards apart, and the culverts be made impermeable to water and to gas.

HISTORIC LINKS IN THE PROGRESS OF ELECTRICAL SCIENCE.

BY H. JOHNSON.

PROPERTIES OF AMBER—MYTHIC ORIGIN ATTRIBUTED TO AMBER—THE LODESTONE—THALES AND THE "SOUL" OF AMBER—RESEARCHES AND WISDOM OF THALES.

IT is proposed to present in these papers a brief account of the chief events and discoveries in the history of electrical science. No attempt will be made to explain any of the phases, theories, laws, mechanical contrivances, or practical results connected with the science, whilst technicalities will be avoided as far as possible. Epoch-making occurrences and discoveries, and important contributions towards the development of the subject, will receive due prominence; but to chronicle all the experiments which took place prior to each distinct advance, and to mention all the industrious workers who sought to increase the sum of electrical knowledge, is not within the scope of these articles. The progress made during the last ten years has not only created a wide-spread interest, but has demonstrated the fact that electric force contains the promise of becoming the most useful phenomenon ever brought under the control of man.

The attractive properties of amber when rubbed formed the first intimation of the existence of electric force. Who first observed such properties it is impossible to say. Perhaps some fisherman in far-off ages, wandering along the shores of Asia Minor, picked up a piece of the beautiful fossil-resin, and found to his surprise and annoyance, when polishing it, that particles of dust and litter would persist in clinging to it as fast as he proceeded with the operation. Or, perhaps, the Queen of Syra, who, according to Homer, received a present of a gold and amber necklace from Phœnician chiefs, discovered the secret power of the much-admired gems. *Elektron*, the Greek name of amber, is supposed to be derived from *ēlektōr*, the beaming sun. Fable tells us that when Phæthon was hurled into the river Eridanus, for his youthful rashness in attempting to drive the solar chariot, his three sisters were so afflicted at his loss that the gods changed them into poplars on the banks of the river, and their tears, which flowed continuously, into amber as they dropped into the stream. Herodotus says that in this river amber abounded. It was, however, obtained in other places—Liguria and on the shores of the Baltic: a fact which rather weakens the force of the myth, unless it happened that enterprising merchants exported the golden tears to distant parts, and made gain of the sisters' grief.

The lodestone, with its attractive properties, was also known to the ancients. It was to be found at Heraclea and at Magnesium, from which name came the words *magnet* and *magnetism*. According to another version, the words originated with a poor shepherd named Magnes, being detained on Mount Ida by the nails in his boots.

Under whatever circumstances the secret power of amber first became known, it evidently failed to awaken any profound attention.

Thales (600 B.C.) of Miletus, the "water philosopher," and the "father" of electricians, is accredited with handing down to the ages, through his disciples, original observations of the phenomena which amber exhibits. He believed that almost everything was possessed of a god or dæmon, and to this "spiritual" cause he ascribed the peculiar power of amber. He also believed that the properties of the lodestone had a similar origin.

To Thales were attributed a good many discoveries and speculations. He believed that water was the origin of all things, that earth is only water condensed, and air water rarefied. He was the first to predict the eclipse of the sun ; and he "defined the magnitude of the sun," says Diogenes Laertius, "as being 720 times as great as that of the moon." He said the earth was in the middle of the world, and moved round its own centre, the sea, upon which it was poised, being the cause of its motion. He discovered the Lesser Bear, defined the seasons, and divided the year into 365 days. He was the first to describe a right-angled triangle in a semicircle, and sacrificed an ox in honour of the discovery. When in Egypt, learning geometry from the priests, he measured the heights of the Pyramids from the dimensions of their shadows. He was "a person who spoke little and thought much." He originated the famous apothegm "Know thyself," which was afterwards engraved on a plate of gold and placed in the Temple of Apollo. He founded at Miletus the Ionic School of Philosophy, and was the first to affirm the immortality of the soul. No wonder that—for all his varied knowledge and wisdom—he was placed at the head of the seven wise men of Athens. The saying that "no man is a hero to his valet" was verified in his case. One day he fell into a ditch, and his aged female domestic impertinently reproached him. "Do you think," said she, "you can understand what is in heaven when you can't understand what is under your feet?" He was one of the world's greatest workers, and lived, some say, until he was nearly ninety. On his tomb were inscribed the words :—

"You see this tomb is small—
but recollect
The fame of Thales reaches to
the skies."

His statue, erected by the proud Milesians, bears this tribute :—"Miletus, fairest of Ionian cities, gave birth to Thales, great astronomer, wisest of mortals in all kinds of knowledge."

It is probable that his keen observations of the properties of amber and of the lodestone formed the foundation of much of his philosophical teaching.

In my next paper I shall hope to speak of Gilbert's discoveries, Robert Boyle, and Sir Isaac Newton ; Conductivity, Attraction and Repulsion, the Leyden jar, etc.

Do not construct solid doors of two kinds of hard wood, as the action of the atmosphere on one or the other will cause the door to warp.

AN ORGAN FOR THE COTTAGE.

BY MARK WICKS.

REQUIREMENTS—SPECIFICATION—CHEAP PIPES—SIZE OF INSTRUMENT—TONE LENGTHS OF PIPES.

In designing an instrument which shall satisfy the requirements of those whose apartments are small, it is necessary that certain conditions should receive due consideration. These conditions are :—(*a*) The instrument must be contained in the smallest amount of space which will permit the pipes to give a good tone. (*b*) It must at the same time have a fair variety of stops. (*c*)

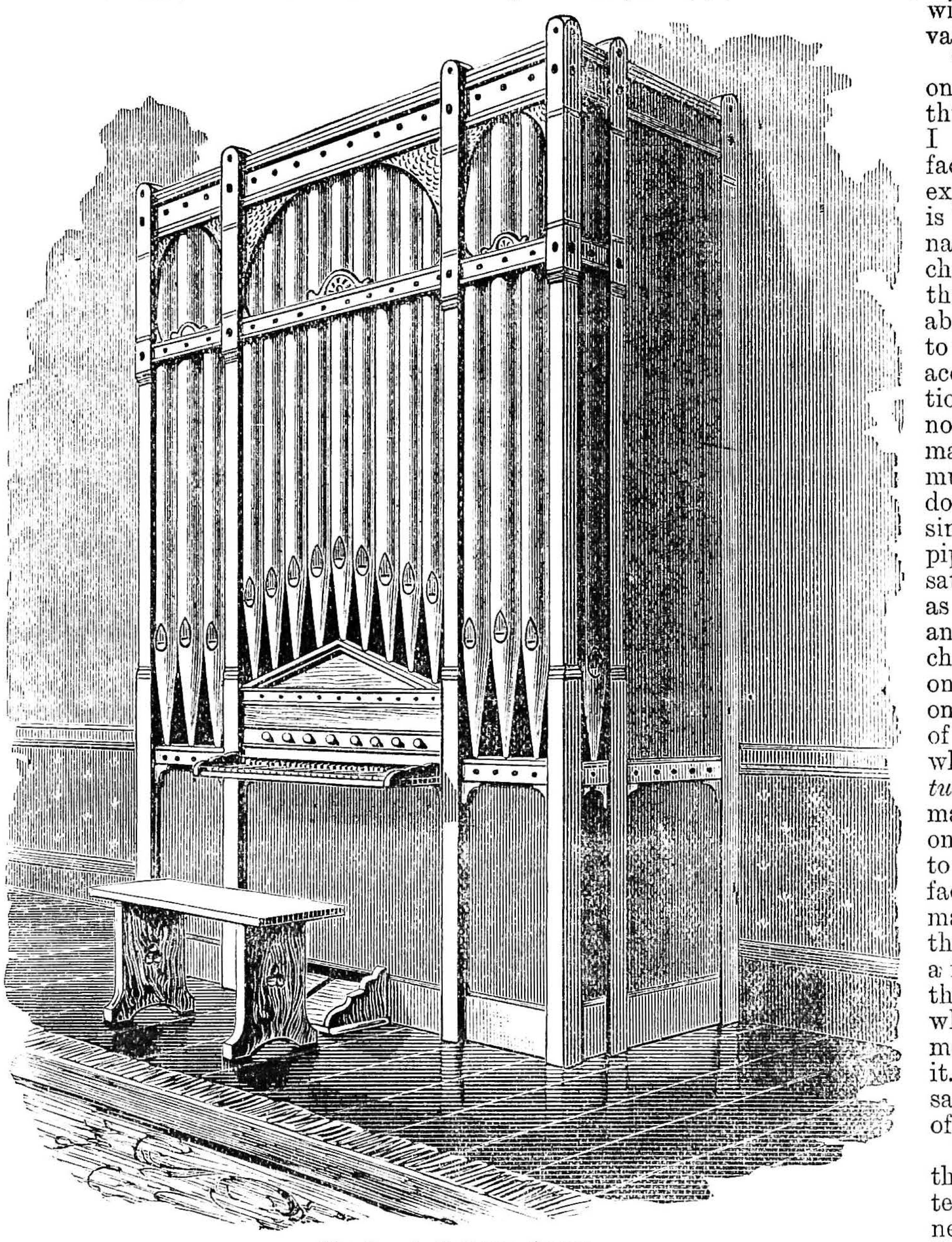


Fig. 1.—A Cottage Organ.

Having regard to the thinness of the walls separating one house from another, the instrument must not be noisy, or it will be a nuisance to neighbours, and result in discord instead of harmony. (*d*) The cost of building must be moderate.

Having carefully considered certain schemes which have suggested themselves to me, I have arrived at the conclusion that the following specification will most satisfactorily meet the several conditions which I have laid down, as I will hereafter indicate. It complies with the first of the conditions, as the extreme size of the instrument is about 4 ft. 6 in. or 4 ft. 8 in. wide, 2 ft. 3 in. deep (not reckoning the projection of the keyboard, as that need not be taken into account, owing to the keyboard being made to slide in like a drawer when not in use), and from 8 ft. to 9 ft. high. A glance at the list of stops comprised in this small space will show that the second condition has not been neglected.

Stops.		*Tone length.*	*Number of pipes.*
1. Dulciana	to Tenor C ...	8 feet	56
2. Flute	" ...	4 "	56
3. Gamba, or Gemshorn	" ...	8 "	56
4. Vox Angelica	" ...	8 "	56
5. Stopped Diapason	Bass ...	8 "	12
6. Flute	" ...	4 "	12
7. Octave coupler throughout the entire compass (48 pipes).			
		Total ...	248

The pipes being made of small scale will secure the necessary quietness of tone, whilst the stops selected ensure that there will also be sweetness and variety.

There now remains only one more condition, and I think readers will admit that I meet it in a very satisfactory manner. The most expensive item in an organ is the music-producing part, namely, the pipes. To purchase a complete set for this instrument would cost about £25 or £30, according to their quality ; but if made according to my instructions, the outside cost will not be more than £2, and may quite possibly be very much less. "How is it done?" Well, the secret simply is that you can make pipes of paper, which will satisfy the most fastidious as regards tone and appearance. Besides being very cheap to make, they are only about one-sixteenth or one-twentieth of the weight of wood or metal pipes, which is another *desideratum* in an instrument that may have to be shifted from one house to another. Added to this, the process of manufacture is so simple that it may be easily acquired by the older boys and girls in a family, who may thus help their father in the work whilst he is engaged on the more laborious portions of it. All the hard work of sawing, planing, and jointing of wood is dispensed with.

But whilst pointing out the advantages of this material I do not propose to neglect the requirements of those of my readers who, being skilled workers in wood, are likely to prefer making their pipes of that material. But I do say that even the most skilled cabinet-maker or joiner would find a great saving both in time and money if he adopted paper for his pipes ; whilst the amateur, who may be a novice, will be entirely relieved of what is rather a difficulty to such persons : namely, the making of long glue joints, which are required in the larger wood pipes, and which must be well done if the pipes are not to be a failure.

Metal pipes I do not propose to deal with, as they require so much skill to make that it would not be worth anyone's while to devote the time and money necessary to its acquirement, merely in order to build a small organ such as I am describing. It would be much cheaper, and very much more satisfactory, to purchase such pipes from organ builders.

On glancing again at the list of stops it will be seen that pedals are not mentioned. They are not required for so small an organ, being too noisy, and as they would take up a considerable amount of room they are, for those reasons, excluded from our consideration.

The complete instrument only requires about the same amount of floor space as a moderate-sized harmonium, although it must be remembered that it will appear much larger on account of its height. This result is obtained by bringing the stopped diapason pipes to the front, so that they form a part of the casing. All the other pipes are enclosed in a swell-box, and greater expression will thus be attainable in playing the instrument. The lowest notes of the other stops are planted off the soundboard at the ends of the instrument, with the view of keeping down the height as much as possible, but the same end may be obtained, without any planting off, by making the lowest four or six notes of stops numbers 1, 3, and 4, of stopped (shortened) pipes instead of open pipes.

But for some of my readers even the small sizes now given may be too large, and in their case I would suggest that the Gamba stop should be omitted: thus reducing the depth of the instrument by about 3 in. If the organ is still too large the Vox Angelica might be left out, or the treble stops carried down from middle C to tenor C, with stopped pipes instead of open ones. This would reduce the height of the instrument to about 7 ft., and the width to about 4 ft. 4 in.; but I must not be understood as recommending the substitution of stopped pipes. Open pipes and the original specification would give a much more satisfactory result from a musical point of view.

It may be convenient that I should here explain what is meant by 8-foot tone in connection with pipes. An open pipe 8 ft. long would give the note C C, which is the lowest note on the ordinary organ keyboard, and *all* pipes belonging to that stop would be termed 8-foot tone. The 8-foot tone is, in fact, the ordinary unison scale or gamut, and from this it follows that any pipe sounding the note C C when that key is pressed is termed an 8-foot toned pipe. A stopped pipe to sound that note would only require to be 4 ft. long, yet it is termed an 8-foot toned pipe. The stopped pipes being only half the size of open ones sounding the same notes enables us to reduce the height of an instrument by introducing them in the place of open pipes for the lower notes of the scale, but as they do not sound nearly so loud as open pipes they must not be too largely used, or the balance of the tone between treble and bass will be destroyed. A stop sounding an octave above the unison is called a 4-foot toned stop, and one sounding two octaves above is called a 2-foot toned stop, and the length of the pipes on the C C channel would be 4 ft. and 2 ft. respectively if open pipes; but only 2 ft. and 1 ft. if stopped pipes. Pipes sounding an octave below the unison are termed 16-foot toned stops, and those sounding two octaves below are called 32-foot toned stops, the latter being only used on the pedal organ in unusually large instruments.

I give a drawing of the organ as it may be made to appear when finished, and will commence instructions in actual work in my next chapter.

The intervening time can be usefully employed by my readers in maturing their plans in the light of the foregoing suggestions.

GOLD EXTRACTING IN VICTORIA.

Gold extracting in Victoria is, all things considered, carried on at a loss, and, with the exception of some fortunate speculators, the public would gain if most of the mines were abandoned.

Two things are absolutely essential for the mining industry in Victoria to become remunerative:—

1. A great reduction in the high salaries of gold miners.

2. A more economic, and particularly a more effective, method of extracting the precious metal than that of amalgamation by mercury, as practised at the present time. With this object the Government of Victoria sent an expert to Germany to study the method of extraction called by the name of its inventor, "Luhrig."

It is not yet possible to express an opinion about the chances of success presented by the application of this method to the auriferous quartzous rocks of Victoria. The following table speaks for itself:—

Years.	*Ounces.*
1881	886,416
1882	879,481
1883	740,373
1884	774,330
1885	783,671
1886	640,872
1887	611,417
1888	636,200
1889	615,055
1890	584,770
1891	621,986

As we see, the past year gives a difference of more than 37,216 oz. over the 1890 product.

In general, the mines of alluvion have been less profitable than those of quartz, and competent men think that this decrease will be further marked in 1892.—*Moniteur Scientifique.*

PHOTO-BICYCLE SUPPORT.

The photographic apparatus is now tending more and more to become one of the indispensable accessories of the bicyclist's kit, and several inventors have set their wits to work to find some light, easily detached supporting arrangement that will permit of reducing the different parts of the device to the smallest possible bulk.

The leg, A, consists of three telescopic tubes, the last of which is provided with an iron point designed to be inserted in the earth. The two end tubes are provided throughout their length with grooves, in which slide two screws that are fixed to the intermediate tube, and that lodge in a slot at right angles to the grooves, so that the tubes cannot accidentally re-enter one another.

The arranging of the leg with the steering gear is clearly shown in the detail of Fig. 3 in the drawing. The vertical bar of the steering gear carries a socket held in place by a screw. A pivot, forming one piece with the socket, allows of the relative displacement of the latter and of the piece to which the leg is fixed. This latter piece is provided with an aperture into which enters the tube upon which the camera is mounted. This camera is provided beneath with a ball and socket joint, and at the top with a spirit level, by means of which the operator can cause the inclination of the camera to vary or to obtain a perfect horizontality, whatever be the respective positions of the bicycle and its leg upon the ground.

For travelling, the camera, E, is removed from its support, folded up, and fixed to the bicycle, as shown in Fig. 2, by means of straps or otherwise, care being taken to interpose small rubber cushions in order to prevent the jarring due to the motion of the bicycle from causing the camera to strike against the cross bar that supports it.

The tubes are afterwards slid one into the other, the upper screw is loosened, and the tube is given a quarter revolution in order that the support, B,

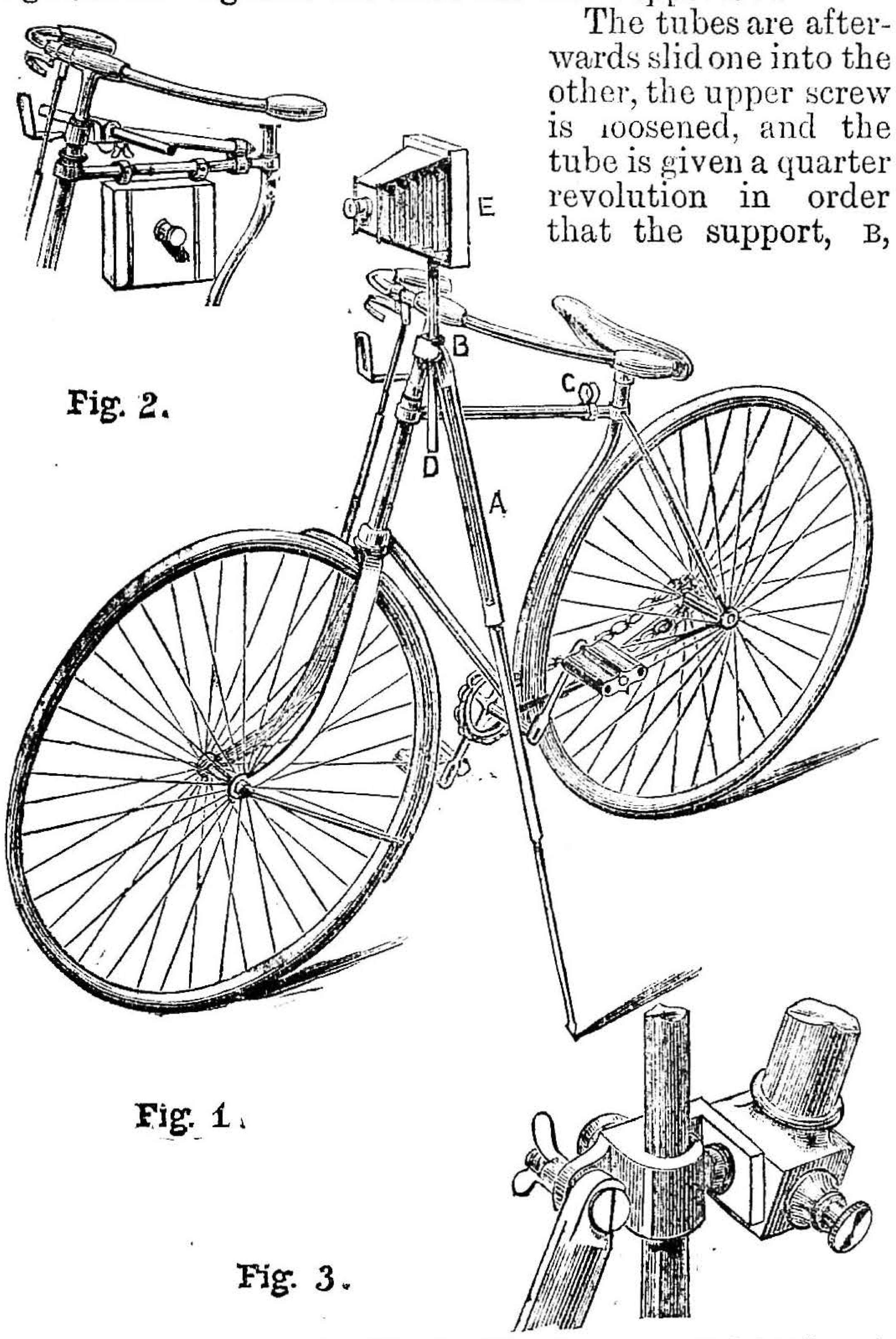


Fig. 2.
Fig. 1.
Fig. 3.

Photo-Bicycle Support. Fig. 1.—Bicycle supported by Leg A. Fig. 2.—Camera fixed to Bicycle for travelling. Fig. 3.—Leg and Steering-Gear Arrangement.

may take a horizontal position, and, finally, the end of the telescopic tube is made to enter the ring, C, fixed to the bicycle frame.

In this motion the socket, D, makes a quarter revolution on the guide bar, and the screw is tightened, and the whole system is then ready for the trip, the leg being in the plane of the bicycle frame and the support, B, being nearly in the plane of the horizontal part of the steering apparatus, so that the wheelman is in no wise discommoded.

Polish.—A fine and lustrous polish for cabinet work can be obtained as follows:—Half a pint of linseed oil, half a pint of old ale, the white of an egg, one ounce of spirits of wine, one ounce of spirits of salt. Shake well before using. A little to be applied to the face of a soft linen pad and lightly rubbed for a minute or two over the article to be restored, which should be first dusted off with an old silk handkerchief. The polish will keep any length of time if well corked.

EXPERIMENTS WITH INDUCTION COILS.

BY G. E. BONNEY.

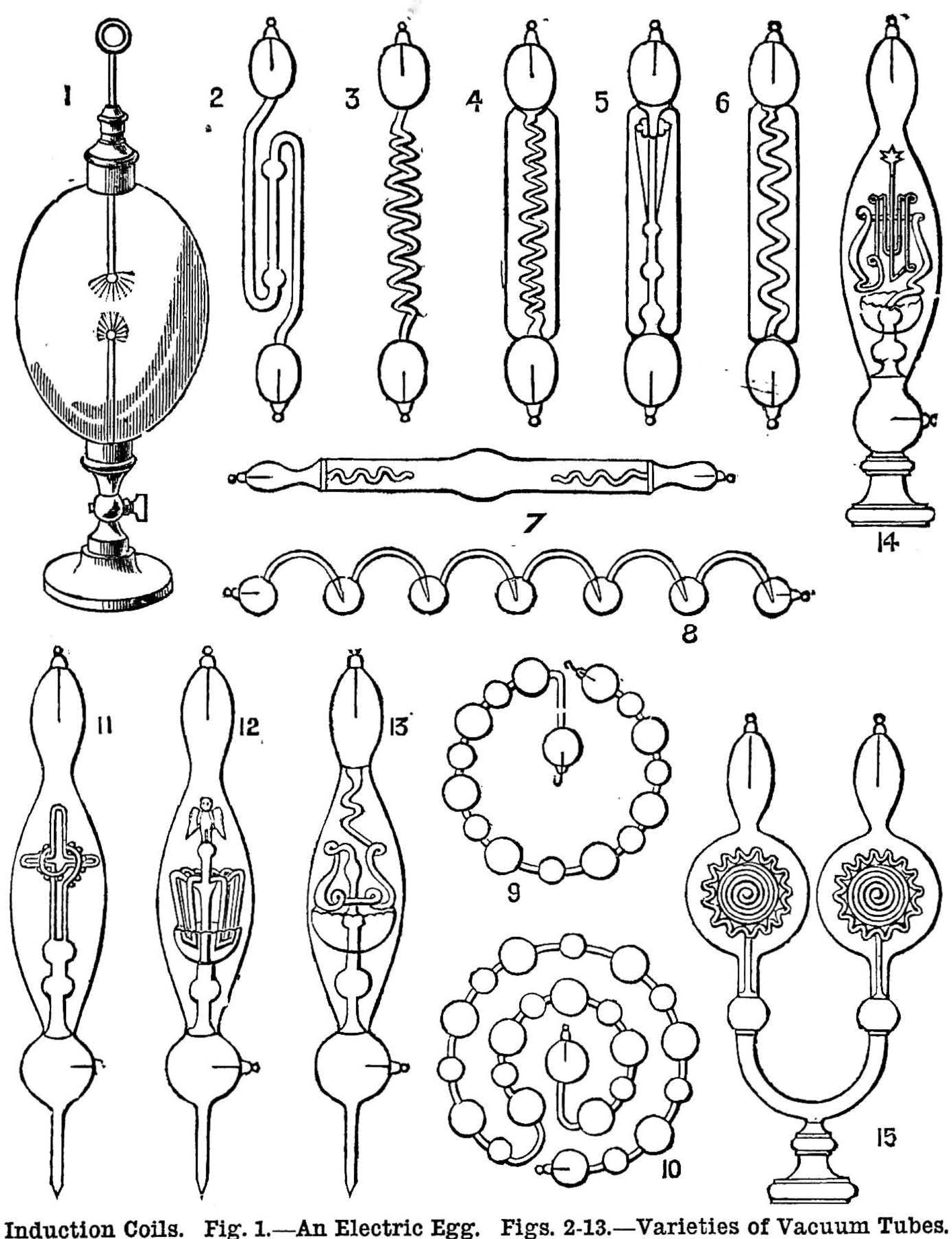
INTRODUCTION — LIST OF EXPERIMENTS THAT MAY BE PERFORMED WITH AN INDUCTION COIL—VACUUM TUBES—GEISSLER OR GASSIOT TUBES.—EXPERIMENTS WITH VACUUM TUBES: THE ELECTRIC EGG — AN ARTIFICIAL AURORA BOREALIS.

Introduction.—A large number of interesting experiments may be performed with spark induction coils of even small dimensions, and many a pleasant evening may be spent in such instructive amusement. Having constructed a coil as directed in the series on Induction Coils, published in WORK, Vol. IV., pp. 2, 54, 117, 148, 212, 342, and 484, we shall naturally wish to use it for some purpose, and in the papers following this I will endeavour to show how a coil may be used. Among the uses to which the induced current from a coil may be put, I may mention the following: 1. Luminous effects in vacuum tubes; 2. Decomposition of water and other liquids in U glass tubes; 3. Electric writing; 4. Charging Leyden jars; 5. Burning iron wire; 6. Burning leaf metal; 7. Exploding fuses; 8. Perforating cards; 9. Lighting gas jets; 10. Lighting a freshly extinguished candle; 11. Lighting spotted jars, flashing panes, etc.; 12. Production of ozone. In addition to these, there are several other amusing and interesting experiments which may be performed on the stream of sparks from a large spark coil. Some of these will be detailed as we proceed.

Vacuum Tubes.—As a large number of interesting experiments may be performed in a darkened room with a spark induction coil and a few vacuum tubes, it will be advisable to become acquainted with these instruments before we detail the experiments to be performed with them. Vacuum tubes, are tubes of thin glass more or less exhausted of air, and fitted with suitable appliances for connecting them in circuit with the secondary terminals of a spark coil. They also receive the names of Geissler or Gassiot tubes, after the names of their makers or those investigators who used them for the first time. The honour of their invention is generally conceded to M. Geissler, of Bonn, who was the first to perform experiments with Ruhmkorff coils and sealed glass tubes.

A common and very useful form of Geissler's tube is shown at Fig. 1, and sometimes known by the name of the "Electric Egg," because of its shape. It consists of an egg-shaped bulb of thin glass, open at both ends, the lower end being cemented into the hollow stem of a suitable stand, made of polished wood or of brass, the stem being fitted with a stop-cock, and a platinum-pointed rod projecting into the glass bulb. The upper end of the bulb is cemented into a brass cap carrying a closely-fitted, sliding, platinum-tipped metal rod, to facilitate adjustment of the distance between the two poles of the instrument. Wires from the terminals of the secondary coil are connected to this instrument by twisting their ends around the step and the cap. These instruments cost from 20s. to 40s. each, according to size and quality, but may be improvised at home for a few shillings by using a gas stop-cock, a stand of wood, a cheap glass bulb or a cylinder of glass, and other home-made fittings.

Another common and cheap form of vacuum tube is made to resemble a glass test-tube, closed at both ends by melting the glass around electrodes of platinum wire. From this simple form there has sprung a very large number of varieties, some of which are shown in the annexed figures (2—15). In some of these the spark from the coil is led through a wavy tube enclosed within the main tube; in others the glass workers seem to have vied with each other in contorting the interior tube into a variety of shapes and patterns, made out of various tinted glass. Finding by experiment that the light from an induction coil spark varies in tint with the gases through which it is made to pass, and also with the substances placed in the tubes, the glass-blower's aid has been again evoked in producing various combinations of bulbs, containing a variety of different gases, such as hydrogen, oxygen, nitrogen, iodine, cyanogen, ammonium, and such substances as mercury and powdered salts, which emit phosphorescent effects as the sparks pass through them. The cost of these tubes vary from 2s. for the more simple forms, through various grades of prices, up to 40s. for those of the most intricate construction.



Induction Coils. Fig. 1.—An Electric Egg. Figs. 2-13.—Varieties of Vacuum Tubes. Figs. 14, 15.—Ornamental Vacuum Tubes.

As vacuum tubes demand an exercise of manipulative skill in glass-blowing, and the use of suitable apparatus for exhausting the air, their home manufacture is placed out of the reach of an amateur. This cannot be said, however, of the electric egg previously described, as this may be made at home if care be taken in fitting the stop-cock and sliding-rod, so as to secure a tolerably good vacuum in the bulb when exhausted of air. This may be done by means of a gardener's syringe or similar large syringe, the nozzle of the instrument being fitted to the stem of the bulb when the piston is down, the stop-cock opened and the air sucked out, then the stop-cock closed again before the nozzle is withdrawn. If an air-pump can be employed, it will be better than a syringe for exhausting the bulb of air; in fact, an air-pump must be employed to get the best effects from these tubes.

Experiments with Vacuum Tubes: The Electric Egg.—Having either made or procured an electric egg (Fig. 1), connect two lengths of No. 20 copper wire to the two terminals of the secondary coil, and attach their free ends to the stem of the egg and the end of the sliding-rod on top. This should always be done when the coil is not working, or unpleasant shocks may be experienced, and possible serious results if the coil is a large one. Slide the upper rod down to within striking distance of the lower rod, and send current through the coil. Only the ordinary stream of sparks will be seen to pass between the electrodes. Switch off the battery, disconnect the coil, and partially exhaust the bulb of air. Now connect the coil as before, and set it in action. Instead of a stream of sparks passing between the electrodes as before, there will now appear a brilliant stream of light illumining the inside of the bulb. The positive pole of the bulb will be illumined by a red light and the negative pole by a violet light. If the coil has been furnished with a commutator or a current reverser, a half-turn of this will reverse the current in the coil and reverse the position of the colours in the bulb. The character of the discharge through this bulb will vary with each effort to exhaust it of air, some of the variations being very interesting and instructive.

After trying the effects of different stages of exhaustion from common air, another series of experiments may be tried with injected vapour of alcohol, ether, naphtha, turpentine, etc., the colour of the discharge varying with each change of vapour. The vapours may be easily injected by holding a sponge, or bit of tow, or a bit of cotton-wool, dipped in the selected liquid, to the opening under the stand, and opening the stop-cock. As the air rushes into the exhausted bulb, it draws some of the vapour with it, and some traces of this will remain after the bulb has been exhausted again. Every attempt at exhaustion will vary the appearance of the light, not only in point of colour, but also in form, as the vapours will assume a more or less stratified form in alternate luminous and dark bands.

By substituting gases for vapours, another series of interesting experiments may be performed, and variations in all the above-named experiments can be made by holding the top of the forefinger to the side of the bulb whilst the current is passing, the light appearing to be influenced by the finger. If a permanent bar magnet is brought near a vacuum tube during an experiment, the luminous discharge will behave as if it felt the magnet's influence, and be bent or turned aside from a straight course by the magnet. By reversing the pole of the bar magnet, the deviation of the luminous ray may be altered at pleasure, and by employing two bar magnets, one part of the ray will appear to be attracted, and the other repelled, by the opposite poles of the magnets.

When the electric egg is charged with vapours or with gases rarefied by exhaustion, the discharge of sparks through it from an induction coil no longer takes the form of a flood of light filling the bulb with its luminous pulsations, revealing the alternating character of the induced current, but is altered to the form of luminous clouds arranged in striæ—that is, as bands and puffs of vapour varying in disposition with the vapours or gases in the bulb, and their rarefied condition. The colour also varies with the gas or vapour introduced. Thus, hydrogen has a white striæ, nitrogen an orange yellow, and carbonic dioxide a greenish tint.

An Artificial Aurora Borealis.—An experiment, illustrating the effects of induced magnetism on an electric discharge, was devised by M. de la Rive for the purpose of demonstrating that the rotary motion of the Aurora Borealis was caused by the influence of terrestrial magnetism. For this purpose he constructed an apparatus resembling the electric egg, with an insulated soft iron rod inserted into its lower end, and brought into contact with one of the poles of an electro-magnet. When the induced current from the secondary of a Ruhmkorff coil was passed through the insulated rod in contact with the electro-magnet, an arc of light formed in the globe of the egg, and rotated slowly around the soft iron rod in a direction easily determined by altering the direction of the induced current, or that of the current passing through the wire wound on the electro-magnet.

To construct a similar apparatus, we shall require a globe of clear glass similar to those in use with paraffin lamps. To the upper part of this globe must be cemented a double stop-cock arrangement, one branch for connection to an air-pump, and the other for the introduction of some liquid, such as alcohol, ether, or turpentine. The lower opening of the globe must then be filled with a soft iron rod and its insulating coating. This rod may be of any diameter from $\frac{3}{8}$ in. to $\frac{3}{4}$ in. It should be long enough to penetrate into the interior of the glass globe to two-thirds of the distance between the openings, and leave half its length outside. Now, respecting the insulation: first warm the rod, and roll it in shellac until it has a thick but smooth coat, thick enough to closely fit into a glass tube the whole length of the rod. Coat this tube with shellac varnish, and fit over it another glass tube. Envelop this tube with several folds of paper steeped in melted paraffin, until a coat $\frac{1}{4}$ in. in thickness has been got on, then well baste the whole with the hot paraffin wax, and make it quite smooth. Over the middle part of this insulated bar, fit a sleeve of thin copper tube long enough to have one inch inside the globe and one inch outside. Cement this into the lower portion of the globe, and fit a collar of brass on the outside with a binding screw for making connection with the coil. From the foregoing details, it will be seen that the thickness of the core and its insulation must be determined by the size of the selected glass globe and the size of its lower opening, since we cannot exactly fix these beforehand, but can adapt the fittings to the glass. The best effects are obtainable, however, from an apparatus in which the globe is over 6 in. in diameter and the iron core from $\frac{3}{4}$ in. to $\frac{7}{8}$ in. in diameter.

To work this apparatus, we shall require an electro-magnet with a core or cores 1 in. in diameter, furnished with a bobbin or bobbins 3 in. in diameter by 4 in. in length, filled with No. 20 silk-covered wire. As only one pole of the electro-magnet will be employed, one core will suffice, but if a horseshoe magnet is obtainable or nearest to hand, it may be used for the purpose. We shall also require a disc of iron $\frac{1}{2}$ in. in thickness, and large enough to cover the pole of the electro-magnet, and form an armature for the same. This armature should be furnished with a set-screw attachment for connecting a wire to it from the secondary of a coil. Lastly, we must have a good spark coil, say, one giving a 2 in. spark or over, and an air-pump to exhaust the globe.

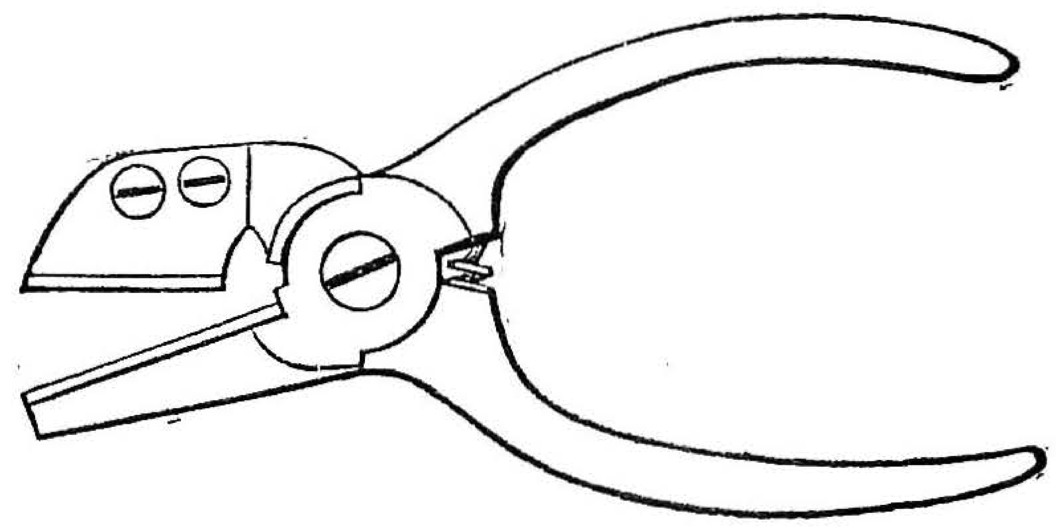
To carry out an experiment with this apparatus: First exhaust the glass globe of air, then introduce two or three drops of ether or turpentine, rarefy the vapour by further exhaustion, connect the wire from the secondary terminals of the coil to the ring of copper or brass beneath the globe, and connect the other wire to the armature of the electro-magnet, then stand the end of the insulated core on this armature, and set the coil in action. A sheaf of light will form inside the globe from the end of the insulated iron bar to the copper sheath or collar covering the part in contact with the globe. Now send a current through the electro-magnet. The streamers of light will all unite on one side of the bar to form an arc of light, and this will slowly rotate around the iron bar. On changing the direction of the current in either the induction coil or the coil of the electro-magnets, the direction of rotation in the arc of light will also change.

Scale in Boilers.—It is estimated that the presence of $\frac{1}{16}$ in. scale in boilers causes a loss of 13 per cent of fuel; $\frac{1}{4}$ in., of 38 per cent.; and $\frac{1}{2}$ in., 60 per cent. It will be wise, therefore, to prevent scale as much as possible.

Tight Screws.—Oftentimes an old screw is in so tight that it cannot be loosened by the screwdriver. The best plan then is to get a piece of bar iron, flat at the end, and make it red hot and place it on the head of the rusty screw, and in two or three minutes it can be drawn with the screwdriver as if it were only a recently inserted screw.

GOOD THINGS.

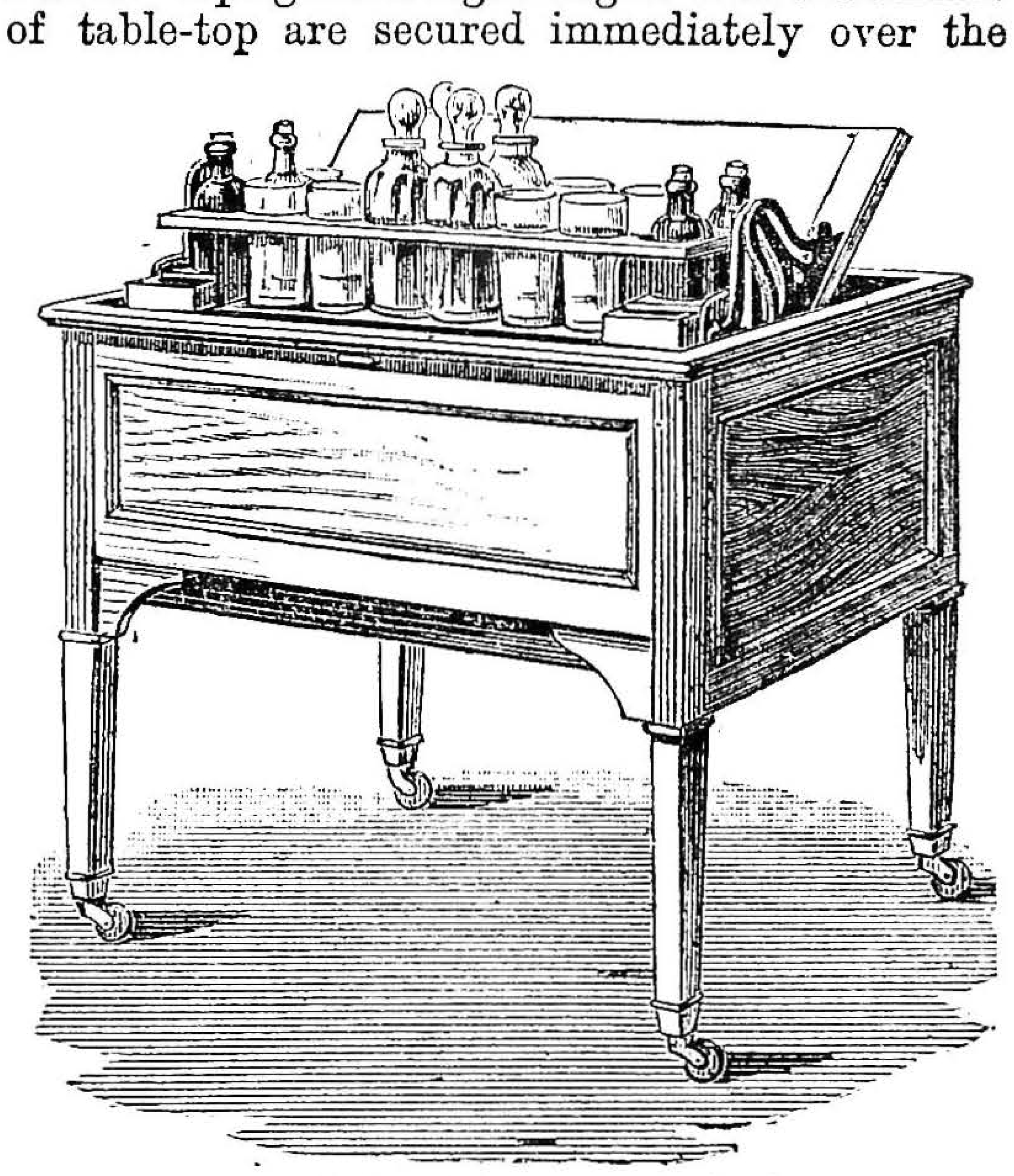
Pruning Shears.—The illustration herewith is that of a recent article brought out by the Alford and Berkele Company, New York. It is called the Ladies' Favourite Pruning Shears, and is intended as a flower and fruit cutter and rose trimmer. This little tool is very desirable for ladies' and florists' use in the greenhouse and



Ladies' Pruning Shears.

among flowers, possessing lightness and ease of operation. Convenient as a pair of scissors, it is much more effective than heavy pruning shears.

Revolving Top Cabinet.—Among the demands of modern civilisation is a marked desire for economy of space, and wherever this is attained a success has been achieved which is pretty sure to supply a want as well as to meet with recognition. This is all the more sure when uniqueness of idea and ingenuity in construction are, in addition, brought into play. For the reason that much of this sort of thing has been introduced into the artistic piece of furniture patented by Mr. Albert E. Batson, of the well-known firm of fancy cabinet manufacturers, we have no hesitation in describing the revolving top table cabinet, which probably will not fail to interest our readers. The top of the table is pivoted in the frame. Uprights at right angles with the surface of table-top are secured immediately over the



Revolving Liqueur Cabinet.

centre. Cradles or frames (perhaps some may prefer to call them trays) are secured, pivoted, and suspended from the uprights, which trays, cradles, or frames contain the articles that presently and instantly are removed from the surface to within and below the top of the table, the cradles, trays, or frames so suspended retaining at all times the contents in a vertical position, whatever the angle the top may be placed at. Turned upside down, the articles or contents are secure, buried or hidden below and beneath the top (which now forms a table-top and a cover to the contents). Reversing the cover or top, and again the cradles, or trays, or frames with contents are brought over the surface of the top of the table. The use and advantage are obvious—a table strewn with glasses, decanters, and such like is immediately cleared, and a tidy and useful table is at the service of the user by his simply reversing the top; that only requires one hand, and the top is secured automatically.

NOTICE TO READERS.

NEXT week's WORK (No. 195) will contain, among other illustrated papers, the following:—

ART OF PLUMBING—JOINT MAKING.
BAMBOO WRITING-DESK AND TEA-TABLE.
HOW TO VENTILATE A ROOM.
THE WAY TO MAKE AN ELECTRIC HAMMER.
HOW TO CONSTRUCT AN ASTRONOMICAL TELESCOPE.
OPEN STRING STAIRCASE MAKING.
LABOUR AND CAPITAL MEN: MR. THOS. BURT, M.P. PORTRAIT AND AUTOGRAPH.

*** The Editor makes this intimation in the hope that readers, having friends interested in any of these subjects, will bring the same to their notice.

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WORK correspondents are wanted in every Town.

AMATEUR AND PROFESSIONAL.—The recent competitive exhibition of the Turners' Company, concerning which we have already offered our remarks, forcibly suggested to us the old question of amateur and professional relationship. In the consideration of this question there is much to dwell upon on both sides. In the instance furnished by the Turners' competition, however, there can be but one opinion. The plan of entirely eliminating one class of work from the other has resulted in the questionable advantage of proving of service to neither one side nor the other. There can be no doubt as to the beneficial results which accrue in bringing amateur and professional work together, if not in friendly rivalry, at least in such relationship that the two will admit of comparison, the one with the other. In exhibitions like the recent display by the Turners' Company, it is perfectly legitimate—quite fit and proper—to show one class of work with the other. We have no misgivings whatever upon the issue. The professional work is almost certain to beat the amateur; it usually does, and it is right that it should do so. This fact offers no justification, however, for the Turners' Company, or, for the matter of that, any other body, for dispensing in such competitions with any particular class of work. The purpose of such competitive exhibitions is, we take it, to advance the craft or art itself; therefore, all contributory elements to this end should be considered. The great aim of British craftsmanship is to beat the world, and if, in competitions such as the Turners' Company recently held, lovers of the lathe—whether professional or amateur—are to be parted, then a salient feature and advantage of such competitions is removed. It is a blind policy which permits proceedings of this kind, and we trust that whenever occasion may offer in this or any other direction for friendly comparison between amateur and professional work, that the foresight of the management will be sufficiently keen to permit them to realise the advantages to be gained all round by rendering such competitions as wide as possible in their scope. All that is needed are distinct classes, the work for which should fulfil the conditions of the class for which it is entered. In this great mechanical age, when the desire of every mechanician should be to win a supremacy for British crafts, it is the sheerest folly to esteem lightly any who may be interested in a particular craft, and which it is in the power of all to assist and extend, whether they be concerned with it either as amateur or professional workers.

ALUMINIUM.—The English manufacture of this metal of the future is one of the romances of modern industry. Eight years ago a company was floated who established works at Oldbury, near Birmingham, to work the Webster and Castner patents. The selling price then was 60s. per lb. By these processes a fancy metal was converted into a commercial one by reducing the price considerably, *i.e.*, 20s. per lb., at which price it was hoped to command the market of the world—the cost of manufacture being about 10s. per pound. In these expectations they were doomed to disappointment. No sooner was the cost brought thus low than it was discovered that our American cousins had forestalled us, for by the aid of electricity in the manufacture, the price was brought still lower, the selling price at the present time being little more than 2s. per lb. This has opened up a vast field for it. Not only is it used for fancy articles, jewellery, and table decorations, to which purposes its fineness and flexibility readily adapt itself; it has already been pointed out in "Work World" that Flemish Dragoons have been testing aluminium horseshoes with satisfactory results. Lieutenant W. C. Brown, of the 1st Cavalry (Denver), has sent to the War Department samples of military accoutrements made of this metal, which he claims to be lighter, cleaner, and more durable, and can be supplied at less cost than those of brass as now used. Owing to its non-rusting qualities, its use is advocated for culinary utensils. Experiments are also being made as to its adaptability for sheathing purposes, it being claimed that, should expectations be realised, we may shortly hear of more record breaking by ocean-going steamers. Meantime the English Aluminium Company, finding themselves beaten on their own ground, have turned their attention to the utilisation of bye-products, sodium, and the chemical products made therefrom. Thus in exploiting one metal and bringing it into general use, and cheapening yet another, they place before us a career that is a truly marvellous instance of perseverance rewarded.

BICYCLING.—The Sixteenth Annual Stanley Show has come and gone, and all concerned—executive, manufacturers, and bicyclists—are to be congratulated upon the splendid success of the exhibition. Ever since the Stanley Club held its first display in 1877 the movement has grown apace, until this year it quite broke the record, and crowded the Agricultural Hall, Islington, with a collection of all the latest bicycling improvements, the extraordinary extent of which was most apparent when viewed from the galleries of the vast hall. One of the most striking features of the show was the competitive spirit of small makers, affording every evidence that the cycling trade—capable as it is of almost untold development—is not to be left altogether in the hands of the big firms. This is as it should be. The more competition there is the better for the trade and cyclists.

SIMPLE IMITATION STAINED-GLASS HALL LANTERN.

BY E. A. SANDERSON.

It is the opinion of all lovers of the beautiful that stained-glass hall lanterns considerably enhance the appearance of our halls.

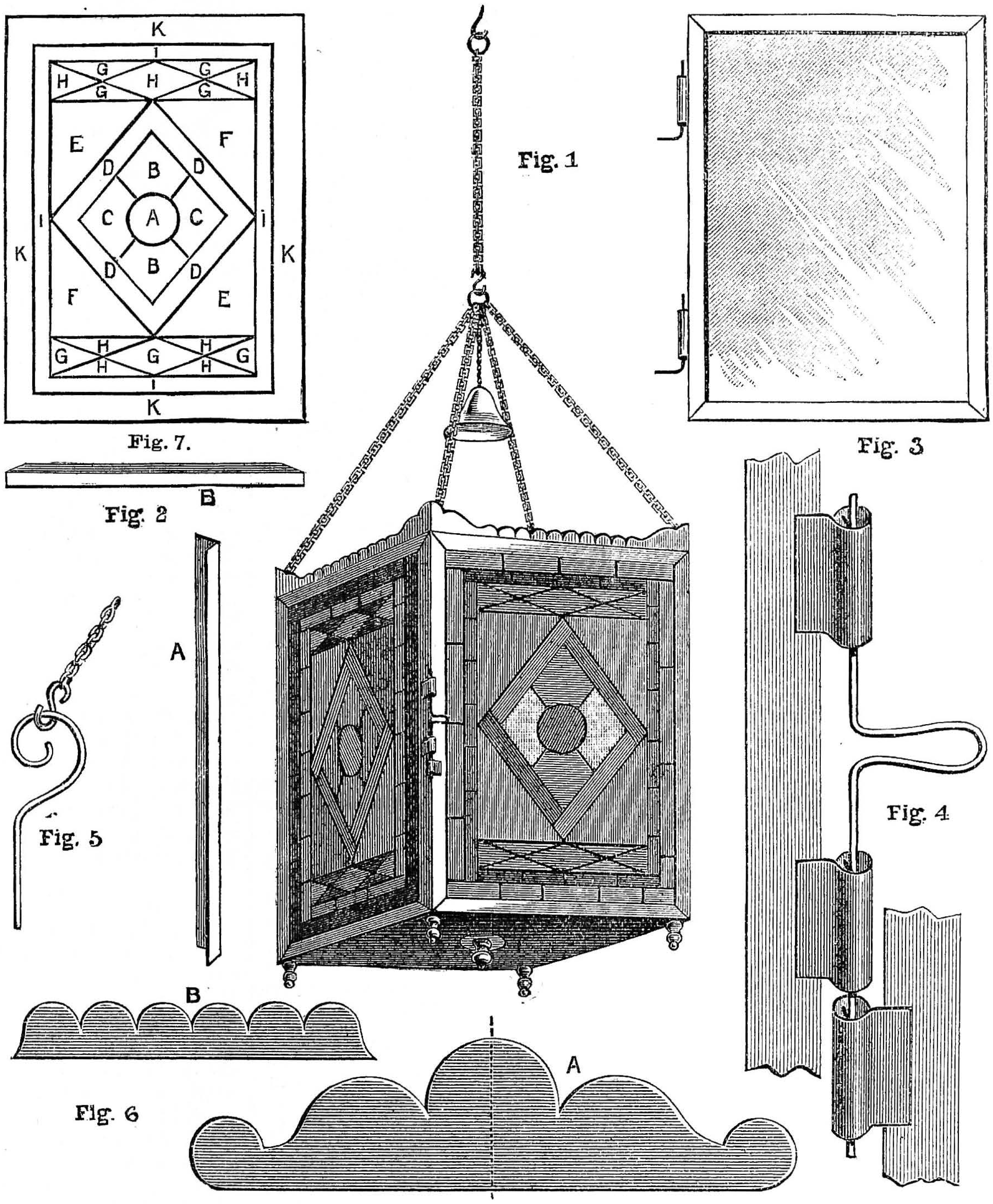
Busy men frequently say that change of work is good recreation; and it often happens that, after having devoted both mind and muscle incessantly hitherto on some elaborate piece of work, it comes as an agreeable relief and relaxation to spend an hour or so making some simple and natty article which will also prove of use afterwards.

The lantern may be connected to a gas-bracket, or it may be used with a detachable oil-lamp, as most convenient to the maker's requirements. The original—an illustration of which is given in Fig. 1—has been adapted by the writer to both alternately; and, as a friend remarked on first seeing it illuminated, it looked better than the 15s. one he bought, and willingly would he have exchanged. Is there, then, need for any further inducement?

The cost of the following materials and fittings required for the construction of this lantern comprises the entire expense we need commit ourselves to—if, indeed, we already possess a few transparent oil-colours—namely: Glass, 1s. 3d.; sheet of tin, 4d.; wire, 1d.; collar, burner, and glass chimney for lamp, 6d.; chains, 10d.; smoke-bell, 6d.; brass ornaments for bottom of lantern, 1s. Total, 4s. 6d.

Even this expenditure may be reduced by dispensing with the ornamental knobs; but such a modification in the embellishments would spoil, I fear, to some extent the lantern's appearance. However, this of course is left to the discretion of the would-be lamp-maker.

Our first outlay, then, must be to buy a sheet of tin (with which to make the framework of the lantern), and upon it to mark off, with a bradawl or other sharp-pointed tool, four 1 in. strips 13 in. long, which must afterwards be severed with a large pair of scissors or snips. Then lay one of the strips lengthwise upon the edge of the bench or a straight piece of board, allowing $\frac{1}{2}$ in. to lap over, and hammer down this overlapping tin to form a right angle, similar to that shown at A (Fig. 2). The remaining three strips—which, with the one just bent, will form the upright stays of the frame—are to be angled in like manner. The length of the top and bottom pieces, numbering eight in all, should be 9 in.



Stained-Glass Hall Lantern. Fig. 1.—View of Lantern complete. Fig. 2.—A, Upright Angle for Corners; B, Angle for Top or Bottom Ends. Fig. 3.—Door of Lantern. Fig. 4.—Fastening for Door. Fig. 5.—Chain Hook. Fig. 6.—A, Corner Piece of Ornament; B, Centre Ornament. Fig. 7.—Design for Stained Glass.

Their only other difference to the former strips is that one wing of each angle must be cut mitre-shape (as shown at B, Fig. 2), so that when four pieces are joined together they will fit properly, and resemble a square tin frame. All joints are to be soldered.

When these 9 in. angled strips have been joined together, we shall have four 13 in. lengths of tin, and two square frames with which to construct the lantern's frame. This may be done in the following manner:—Take one of the tin frames, lay it upon the bench, mitred side underneath, and into each corner fasten the four upright angles (but merely tacking them together until the other end is fixed in position); then, if all is found to be square, each joint should be permanently soldered. We will then have the frame of our lantern complete, minus the door, which latter appendage must be our next consideration.

Four strips of tin, all 1 in. wide, two of them 13 in. and two 9 in. long, are to be cut off the sheet as before, and each doubled in two until a groove is formed, of only sufficient width to allow the glass to slip in. Firmly join three sides of the frame together, but, before fixing on the other end, slip the glass in its place. The four corners of the frame are to be mitred together. It will be advisable to leave the staining part of the business until the last thing, as it can be done as well with the door fixed on the lantern as when off. But before leaving this portion of our work we had better make and fix on the bolt and hinges.

To make the bolt, bend the centre of a piece of 16^{3} or 18^{3} wire, 6 in. long, into a kind of loop, as shown in Fig. 4, allowing 2 in. for bending, in order to reduce the length of the bolt when thus made to 4 in.

Now take five pieces of tin, each $\frac{3}{4}$ in. square, and convert $\frac{1}{2}$ in. of their width into a tube, leaving $\frac{1}{4}$ in. of tin quite flat, by which they may be attached to the framework, as seen in the diagrams. Three of these tubes are required for fastenings, and two for hinges. First solder two of the fastenings on to the door-frame—one at a distance of 5 in. from the top, and the other that distance from the bottom, thereby providing a space of $1\frac{1}{2}$ in. between the two pieces—taking care that the turned edges come flush with the outer edge of the frame. In Fig. 4 I find that these two fastenings are shown as projecting beyond the edge of the frame. This is incorrect, as the result of such a position would be to prevent the door from closing properly. One of the other tubes should afterwards be soldered on to the frame of the lantern in such a position that it will come exactly under the lower fastening on the door when the latter is shut close, and will also allow the wire bolt to pass freely through. A glance at Fig. 4 will explain matters simply.

The two remaining tubes should now be fastened on to the reverse side of the opposite end of the door—one about 3 in. from the top, and the other that distance from the bottom—to serve as hinges. This done, bend two pieces of wire—the same kind as used for the bolt—both 1¼ in. long, into right angles, ¾ in. by ½ in., and solder the small lengths to the inner part of the lantern-frame, with the ¾ in. lengths (on which the door will hang) pointing upwards. The easiest mode, perhaps, of fastening the wires in their true position is to first slip their long lengths into the tubes on the door, lay the lantern down upon the side opposite to that on which the door is to go, adjust the door in its place, and solder the ½ in. lengths on to the inner side of the frame as they hang. The door should then open and shut easily.

We had better next make the hooks required for attaching the hanging chains to the lantern, using the same kind of wire as hitherto, and, when made, strongly soldering the straight parts into the angle at each top corner of the lantern. An idea of their shape is indicated in Fig. 5.

Our attention may now be turned to the ornamental part of our work. That running round the top of the lantern is made of tin, and consists of corner and centre pieces. To make the corners, draw the design given at A (Fig. 6) full-size on stout cardboard, and cut it out as a pattern; lay it on to a piece of tin, 4 in. by 1 in., and cut the tin to the cardboard shape. Make the remaining three pieces in like manner. Then, when all are finished, find the half of each, bend them at right angles, and afterwards solder them on to the lantern. Now proceed to cut out four tin strips, 5 in. long by ¾ in. wide, divided with a pair of compasses into six half-circles (see B, Fig. 6), and secure them with solder between the corner-pieces.

Glass-staining—or, to speak more correctly, painting—should be the next operation. Tube-colours are preferable for this work, and they should be mixed with white varnish. Those readers who do not consider themselves competent for such artistic work might save themselves the trouble by using the "glacier" transparencies as substitutes. These transparencies would, of course, look well, but, not having used them for this particular purpose myself, I cannot express any confidence that the heat would not cause them to curl off, or otherwise affect them. On the other hand, it will be found by the amateur who employs his own artistic skill that the heat gradually burns the colours into the glass, and imparts a subdued but rich lustre to the various tints, almost rivalling in appearance and utility the genuine stained glass. However, each must decide for himself.

The design need not be elaborate for this article; indeed, consistent with good workmanship, the simpler it is the better it will look. The following instructions will probably be useful to the amateur lamp-maker who intends painting his own glass:—

First set out on a sheet of paper the design full-size, and afterwards trace the outline upon the glass. The two borders, K and I, in the diagram are to be respectively ¾ in. and ½ in. wide, while the top and bottom strips containing the small diamonds, G and H, should be about 1½ in. in width. The remaining space may be filled up with a diamond, having a border of, say, ½ in. width, and in the centre a circle having a diameter of 2 in. This design looks effective, and, with a variety of tints tastefully arranged, will answer for the four sides. The colours should be applied with a fair-size camel-hair brush, and finally stippled with the tip of the second or third finger, in order to obliterate the brush-marks and to produce a softened effect. One coat will be found insufficient; therefore, when the first is hard-dry, apply a second coat of colour, likewise stippling it. The tints to be used and their arrangement must be left to individual taste, but the following combination has a very good appearance, and can be recommended.

The outside border, K, emerald; border marked I, ruby; the small diamonds marked G and H, alternately Prussian (or deep) blue and purple; triangular spaces E and F, yellow and light blue; dark border of large diamond, purple, and light part, emerald; spaces B and C, within the latter, light blue and yellow; circular centre-piece, A, ruby. The tints on two of the sides opposite each other should be arranged alike, but the other two, if different, will have a better effect. For example: Outside border, ruby; inner border, purple; small diamonds, dark blue and ruby; border of large diamond, light blue and yellow; outside triangular spaces, emerald and puce; inner spaces, ditto; circle, Prussian blue.

Lining is the next process, and is accomplished by means of a bevelled straight-edge and a small fitch, the lines being drawn with lead-colour, about ¼ in. wide, on the painted side of the glass. The safest and easiest method of painting a ring round the circle is to cut out a stencil for it. Before fixing in the glass, give the outer side of the tin framework a coat of bronze green. The inside must be kept clean, with the exception of the door; otherwise, the solder will not hold. But the framework of the door, being made on a different principle, should receive a coat of the same colour on both sides.

So soon as the paint is dry, the glass may be fixed in its place—viz., the inside of the frame. The simplest way is to lay the frame on the side in which the glass is to be fixed, and insert the glass in its proper position, painted side down. Then cut four bits of tin about 1 in. square, and bend each piece (allowing for the thickness of the glass) so that one part will lie flat on to the frame, while the other half will be just wide enough to hold the glass firmly. Solder them at each corner of the frame. The ground glass at the bottom of the lantern is best not fixed, but simply resting on the ledge made for it, as it can then be conveniently taken out at any time and cleaned.

The brass ornamental knobs may be easily attached to the glass or tin by means of a preparation called gutta-percha cement. This is a composition, as its name indicates, of gutta-percha and other flexible and adhesive properties; it is made up in cakes, and forms a very valuable cement for any article that does not constantly come into contact with water or great heat. A sufficient amount of the cement to cover the flat end of each knob should be used, and heated until it bubbles, when the brass knob must be pressed firmly against the glass or tin. This cement is obtainable, I believe, of almost any ironmonger or bicycle manufacturer.

Four 12 in. lengths of chain are now required to complete the lantern proper. These should be connected by one end at each corner with small brass hooks, and the other end of each chain to a ring suspended from the ceiling by another piece of chain, the length of which must depend on the height of hall.

Those who wish to make an oil-lamp to stand inside the lantern may do so in the following economical manner:—Get a round tin can possessing a lid (a large condensed-milk tin will do capitally), bore a hole in the centre of the lid large enough to allow the cotton wick to pass through, and afterwards solder the lid on the can. This will answer splendidly as a reservoir. Now we want a collar, burner, and glass chimney, all of which can be bought at any Italian stores for a few pence. Solder the collar over the hole in the lid, screw on the burner (fitted with wick of correct width), slip on the chimney, and the lamp is capable of shedding forth light—if the reservoir contains oil.

Finally, a small brass or glass (the choice is optional) smoke-bell is another requisition. It is required not only to protect the ceiling from discoloration by smoke, but also to serve as a further ornament to the lantern. Hang it over the light by a chain of suitable length.

ELECTROLYTIC ANALYSIS OF SULPHUR IN RED COPPER.

The method generally employed for analysing sulphur in red copper is that of Fresenius, but it is long, difficult, and subject to errors. It is, however, of great importance to fix exactly the amount of sulphuret of copper contained by copper, for these impurities greatly change the physical properties of the metal. A new electrolytic method suggested by M. C. A. Lobry de Bruyn seems more accurate and rapid. According to *L'Industrie Electrique*, twenty-five parts of copper are dissolved in nitric acid, then the solution is electrolysed until twenty parts of copper are deposited. The liquid is then evaporated to expel all the acid, and the electrolysis concluded. During this time the sulphur has been converted into sulphuric acid, which can easily be calculated, there being no longer any copper in the liquid.—*Moniteur Industriel.*

TOOLS OF EGYPTIAN PYRAMID BUILDERS.

Egyptian stone-workers of 4,000 years ago had a surprising acquaintance with what have been considered modern tools. Among the many tools used by the pyramid builders were both solid and tubular drills and straight and circular saws. The drills, like those of to-day, were set with jewels (probably corundum, as the diamond was very scarce), and even lathe tools had such cutting edges. So remarkable was the quality of the tubular drills, and the skill of the workmen, that the cutting marks in hard granite give no indication of wear of the tool, while a cut of a tenth of an inch was made in the hardest rock at each revolution, and a hole through both the hardest and softest material was bored perfectly smooth and uniform throughout. Of the material and method of making the tools nothing is known.

Electrical Accumulator Plates.—A new alloy for this purpose, almost unattackable by acid, is made by adding 22 parts of antimony to 945 parts of melted lead, and, at the moment of pouring into an ingot-mould, introducing 13 parts of mercury. The ingot can be rolled out into thin plates.

HOW TO CONVERT AN ALTAZIMUTH INTO AN EQUATORIAL TELESCOPE STAND.

BY O. BECKERLEGGE.

APPARENT MOTION OF STARS—AXIS OF TELESCOPE PARALLEL TO THE EARTH'S AXIS—ALTAZIMUTH AND EQUATORIAL—CONVERTING THE FORMER INTO THE LATTER.

EVERY young astronomer who has a telescope, mounted so that it allows of vertical and horizontal motions, has realised the difficulty of following a celestial object, inasmuch as its path is always oblique and not parallel to the horizon. In the diagram Fig. 1, Y Z is the horizon, and S T a line perpendicular to the same. Now, it will be apparent to the most inexperienced, that a telescope, mounted with its axis of rotation in this perpendicular manner, as A, would, if caused to revolve, mark out circles in the heavens parallel to the horizon, as 3—4. The star, *a*, in the field of vision, would cross the field in an oblique manner, as shown by the dotted circle, 1. To follow this star the telescope would not only require to be turned on its horizontal axis, but also on its vertical, raising or depressing it, as the object might happen to be east or west of the meridian. To do this with an instrument of low power is not easy, whilst with an instrument of high power it is all but impossible. To follow a star with only one motion an equatorial stand is required.

Everyone, even the most casual observer, has noticed, for example, that the Great Bear, that most conspicuous of all constellations, revolves round a point near to the pole star once in each twenty-four hours. When the constellation is to the north, it is low down in the sky, but climbs higher and higher until it reaches its meridian.

To the uninitiated it has always appeared as though the observer was on a fixed point and the heavenly orbs were whirling around him. But, as even the youngest observer now knows, the motion of the stars is only apparent and not real, the true cause being that the observer is being carried onward by the diurnal motion of the earth, and so his relative position to the fixed stars is continually being altered. The writer witnessed an unusually interesting optical illusion illustrative of this some time since. Riding in a fast train, the line skirted a large field which had been ploughed with the furrows at right angles to the line of motion. The first mental impression as we rushed past, and the furrows, each one in rapid succession, opening out and then appearing in perspective to meet in the vanishing point, was that the observer was stationary, and that the field, like a great wheel with innumerable spokes, was being rapidly revolved on its centre. This, on a magnificent scale, is the optical illusion which so often baffled the early astronomers. They were fixed—so they thought—and the celestial scenery revolved around the pole star.

Having mastered this fact, that the earth revolves, it was comparatively easy to discover that if a line were drawn from the point of observation to the pole star, or, what is the same, a line parallel to the earth's axis, and a telescope were caused to revolve around this line as an axis, it would follow and hold a star in its field of view as long as it was above the horizon. In Fig. 1, S N is the polar axis. If a telescope, as B, is made to revolve regularly around this point once in twenty-four hours, it would cut a circle, as the dotted line, and if a star were in the field of view, as at *b*, it would be retained there through the whole revolution. The dotted circle, 2, shows the path of a star which just dips at one point below the horizon.

A third fact would soon be apparent: that if an observer were stationed at the pole of the earth's axis, the heavenly bodies would appear to revolve in circles parallel to the horizon, and that, on receding from that position towards the equator, the angle included between the pole star, N, point of observation, S, and the horizon, Y, would become more and more acute, until at last the observer would reach a point where the pole star would lie on the horizon, and all stars would rise and set at right angles to it, and the day and night would each be twelve hours long.

We now arrive at the last point I wish to mention in relation to this subject, that is: we must first ascertain the latitude of the point of observation, and make the axis of the telescope to correlate with it; or, in other words, the axis of the telescope must, at all times, be parallel to the earth's axis. We will suppose that we are fixing a telescope, say in Liverpool. On looking at any good atlas we find that Liverpool is 53½° N. This, then, must be the angle of our polar axis. Having mastered these several points, there is little else to do beyond mere mechanical work.

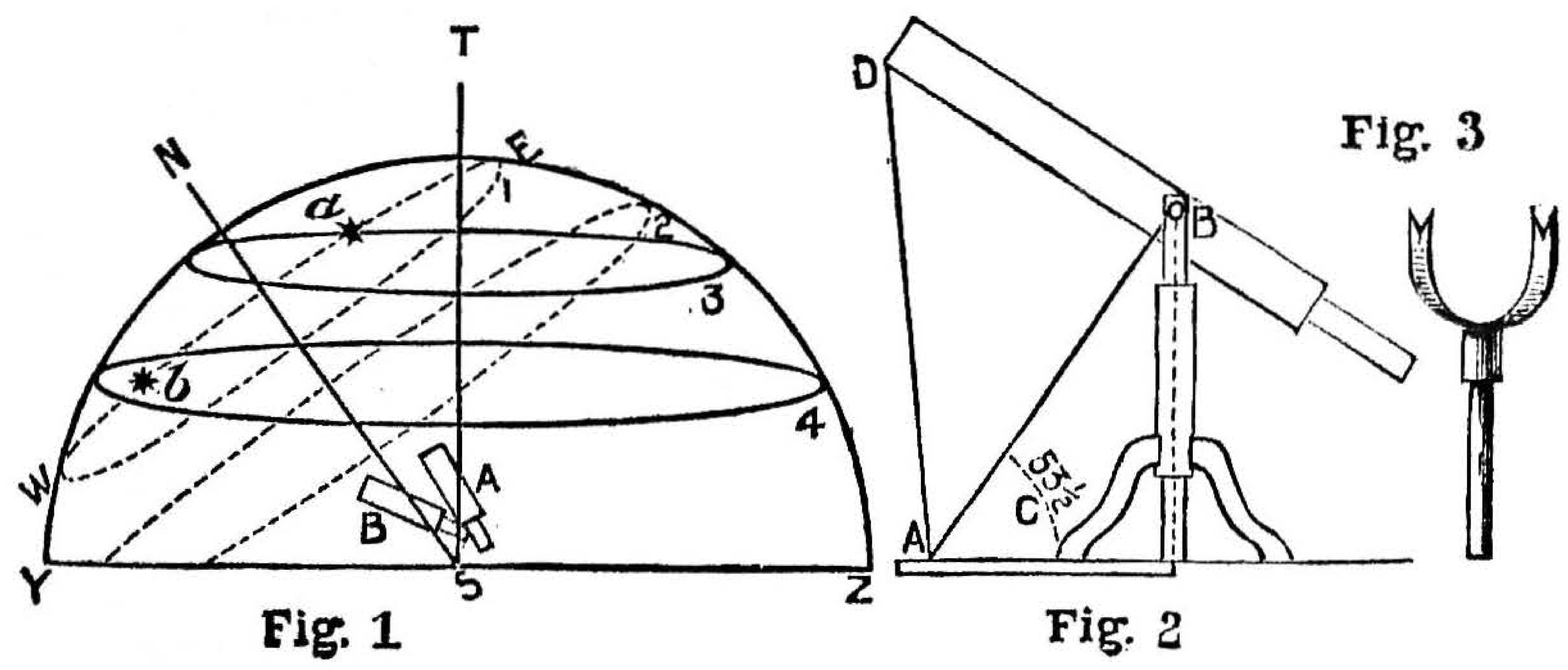


Fig. 1.—Diagram of the Heavens—S N, Elevation of the Polar Axis around which the Stars seem to revolve. Fig. 2.—An ordinary Altazimuth Stand adapted as an Equatorial, A B being the Elevation of the Pole, which is equal to the Latitude of the place of observation. Fig. 3.—A Crutch to receive the Trunnions on the Telescope.

But the mechanical labour required for the construction of a good equatorial must be of no mean order. It is not for this class, however, that I am writing this article, but for those whose skill is limited, yet who desire something handier than the Altazimuth. Fig. 2 represents the latter stand adapted or altered to an equatorial. It may be said here that the writer makes no claim to originality; indeed, it might be difficult to determine who was the first to work out the idea. Some years since Lord Lindsay published something on it, but before him two or three other astronomers of great reputation adopted a plan of which his was a modification, and the design I have given is a modification of his, the only point of difference being, that in my design I place the axis in alt coincident with the axis of the telescope, and not underneath, as is generally found in telescopes with Altazimuth mounting. This difference, though at first sight it may appear of little importance, is really of considerable value. It is evident that if the axis of motion is outside the instrument, then the instrument will revolve around it, and not around its own centre; but in any kind of equatorial mount it is absolutely necessary that both major and minor axis of the instrument should be coincident with its optical axis, for if not, no matter what device we may adopt, the object would be continually creeping out of the field of view. I have extended these remarks, perhaps, some people may think, unduly, but they must consider that there are always some readers just starting to learn, and it is those I have in my view, and for whom I write. We will suppose we possess a telescope with a three-legged stand. If the joint for giving altitude is underneath the instrument, then a crutch, as Fig. 3, should be made, either in iron or brass. Y-shaped slots may be cut in the arms of the crutch. Pins must be let into the telescope tube, either screwed or soldered, to act as trunnions to rest in the crutch. Care must be taken that these pins are true with each other. Fix the telescope stand firmly to a small tube or platform, care being taken that the stand is perpendicular to it. Fasten a strong rod of wood to the platform, so that it forms with the stand a right angle. Cut, either in wood or metal, a templet of an angle equal to the latitude of the place of observation, that of Liverpool being 53½°—C, Fig. 2. This must be carried along the rod until a line drawn from A to B shall touch the edge of the templet. At the point A a hole must be bored large enough to take a strong cord. A small eye should be fastened to the telescope tube, as at D, in a line with the O.G. To this a strong cord is fastened, the other end passing through the hole at A. A screw may be placed in the end of the rod to clip the cord, or a cleat may be fastened on the under side of the rod, around which the cord may be secured. Now place the instrument on any suitable stand with the imaginary line, A B, pointing to the pole star. Bring the instrument to bear on any particular star desired, and fix it by the cord, D A. It will now be seen that if moved to right or left it will no longer revolve around either the perpendicular or the horizontal axis, but around an axis that lies in a line from A to B. In other words, it moves on a polar axis, and the circles which the instrument makes will be circles equidistant to the pole star. If our work has been done with care one motion will keep a star fairly well in the field of view. I have, I think, in "Shop" given a very simple method for finding the true north, so need not refer to the matter further. If, however, there is any obscurity on the subject I have written on, I shall be pleased to answer any question, and give what further information I can.

GALVANO PLATING WITH IRON AND NICKEL.—Solution 1, for iron: Take equal parts of pure sulphate of iron and of the sulphate of iron and ammonia, to which is added 1 in 1,000 of sulphate of magnesia. The solution should have a strength of 18° to 20° B. Solution 2, for nickel: To a solution of sulphate of nickel and ammonia, 2 per cent. of sulphate of magnesia and 2 per cent. of boric acid are added, and the solution is then neutralised with carbonate of magnesia. The bath should have a strength of 8° to 10° B.

TRADE: PRESENT AND FUTURE.

*** *Correspondence from Trade and Industrial Centres, and News from Factories, must reach the Editor not later than Tuesday morning.*

COTTON TRADE.—The great lock-out continues, with no indications of weakness on either side. Several mills have adopted short time, and this has greatly strengthened the masters' position. It is thought that many other concerns will speedily adopt short time, but the operatives rely upon the increased demand for yarn forcing the masters to reopen the mills. Our Rochdale and district correspondent writes:—The Masters' Federation has succeeded in prevailing upon the majority of the mill owners in Rochdale to place their *employés* on short time; consequently, notices have been posted in the mills, stating that the mills will only work twenty-eight hours per week until further notice—this being half-time only. The *employés* are calling a meeting to decide what is to be done as regards the levies under this new regulation, as if they continue to pay the 5s. 6d. per week as before, it will be paying away nearly half of their wages. The question of arbitration has been spoken of again in some quarters, but after the reception which the proposal received before it is not likely the dispute will be settled in this way.

CUTLERY AND SILVER TRADES.—Cutlery trade is dull, while the electro- and silver-plate trade has improved.

SKATE TRADE.—Skate makers are busy with Sheffield-made skates, although vast numbers of cheap imported skates are sold.

PAPER TRADE.—This suffers from the prevalent depression, but more severely than the paper trade is wont to suffer. Many mills are running short time, with no prospect of improvement.

HEAVY TRADES.—Improvement marks the heavy trades of Sheffield. Hematites have declined from 60s. to 54s., according to brand. Railway material is in moderate request.

COAL TRADE.—The Northumberland coal market is easy, best steam coals being from 9s. 3d. to 9s. 6d.; second qualities, 9d. to 1s. per ton lower. Small steam, 3s. 9d. to 4s. per ton. Bunker coals are dull. Gas coals, in large demand from 7s. 6d. to 8s. per ton. Coke is firm.

CHEMICAL TRADE.—The chemical market is flat, with a limited amount of new business.

IRON TRADE.—The Middlesbro' iron market shows an improvement, and shipments continue heavy. The finished iron and steel trades are slack, steel makers being very short of orders; but rail makers continue fairly well employed.

TIMBER TRADE.—Our Hartlepool correspondent writes:—The demand for sawn wood is very brisk, most of the merchants having their hands full of orders. Large timber is being moved from the ponds, especially sawn pitch pine. Norway timber orders are as brisk as ever; also for odd lots of Swedish. There is no doubt there will be a good trade up to Christmas. Pit timber orders are plentiful, especially for Staffordshire and the Midlands. Our Liverpool correspondent writes:—At recent sales mahogany brought from 2¼d. to 2s. 9d. per foot, according to quality; American walnut, 5s. 6d. per cubic foot; American whitewood, 1s. to 1s. 7½d. per cubic foot; satin walnut, 1s. 2½d. to 1s. 5d. per foot; lignum-vitæ, 74¾ tons sold at from £6 5s. to £15 per ton; rosewood, 5 tons sold at from £10 to £11 15s. per ton.

SHIPBUILDING TRADE.—One or two new orders are to hand. Messrs. Laird have obtained an order to build a magnificent yacht, upwards of 200 ft. long, for the American millionaire, Mr. Vanderbilt, and six steam barges are being built by Messrs. R. Gilchrist & Co. for Manchester Ship Canal traffic. It is estimated that removing the sailings of the vessels *City of Paris* and *City of New York* to Southampton will occasion a loss in revenue of £250,000 per annum to this city. The Dock Board have held a meeting to consider the advisability of lengthening the present landing stage on the Mersey with a direct railway connected to it, also the building of another stage for Atlantic passengers and for cattle, etc.; the former to cost £220,000 and the latter £350,000. This having been passed, a Bill is to be promoted in Parliament for the purpose of accomplishing these schemes. This means a good deal of work.

ENGINEERING TRADE.—There is next to nothing doing in the Lancashire engineering trade generally, although here and there stationary engine builders and boiler makers are giving more encouraging reports. The returns for the past months issued by the engineering trade unions show a further increase in the number of unemployed. The Amalgamated Society of Engineers have now nearly 8 per cent. of their members "out." About 4½ per cent. of the members of the Steam Engine Makers' Society are returned as unemployed.

STEEL TRADE.—Ordinary foundry hematites do not fetch more than 56s., while steel billets are readily offered at 87s. 6d. The steel plates for the Watkin Tower are now being supplied at a very low rate. In Cumberland 3,000 steel workers have been discharged, owing to scarcity of orders.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

I.—LETTER FROM A CORRESPONDENT.

Turning and the Turners' Company.—CYMRO writes:—"In WORK, No. 183, p. 418, you reminded us as to the Twenty-third Annual Prize Competition of the above Company, which took place in October, when you hoped a good collection of turnery would be exhibited. All your readers would have wished the same success to this institution but for the statements which revealed the serious condition into which this once flourishing concern has been brought. For myself, I have now a full answer to what has been a puzzle to me since the October Exhibition, 1890. To this I paid a visit, thinking to have the satisfying pleasure of seeing the largest and grandest show that could possibly be shown at any one time or place. In this I was greatly disappointed. Upon entering the room—after a great deal of trouble in finding it—thinking it to be a pottery warehouse, I remarked to an official that my errand was to see the Turners' Exhibition, and that I had travelled from Wales for that purpose; I did not want to purchase any flower-pots: would he be kind enough to put me in the way to find it? He assured me I was in the right place. What I thought flower-pots at first glance were vases and urns in terra-cotta, some in the rough, and others in a finished condition. No doubt they were specimens of good workmanship in their class. Also a few exhibits in Derbyshire and Cornish stone of first-class quality and splendid workmanship. At last, in one corner, I came across the lathe work. There were only two exhibitors, one of whom must have sent his work as a joke. But the other, a case of ivory and blackwood—said to be the work of a first-class gentleman amateur—was most exquisitely wrought. The ivory boxes bore ample evidence of the skilful handling of the rose engine and spherical rest, whilst the blackwood box testified to the same artistic manipulation of the medallion machine, having upon its cover a most beautifully worked medallion of Rubens. Such work as this, although few can rise to it, has a wonderful influence upon the amateur of less degree. He may be pleased and satisfied with his own work, but when he sees that of first-class workers, he is stimulated to aim higher, and in this endeavour he accomplishes better results. But what about the blackballing of amateurs? Can it possibly be that they have been weeded out, one by one, down to the last, as the 1890 Exhibition showed, from motives that are best known amongst the managers of the Company themselves? Has a partiality been shown, and preference given, to workers upon lathes and tools of certain makers? If so, then the sooner we 'throw up the sponge' the better, most certainly. The person who has made the tools to cut spirals in separate strands upon his screw-cutting lathe, perhaps, had better keep his work under cover for awhile. He would not only be denied a sixpenny script by the Worshipful Turners' Company, but would be boycotted for daring to make a tool himself. To remedy all this, Mr. Editor, I would suggest you take in hand the formation of a society of all workers, whether amateur or professional. Members to pay a fee for entrance; the first year's expense to be met by subscription or a guarantee fund; afterwards it would be self-supporting. This would meet a great want and, I think, be very acceptable to the tens of thousands who read your valuable paper, WORK."—[Will CYMRO set out the lines of such a society? If it can be worked we shall be pleased to give all the assistance in our power. It is for amateur and professional workers to decide the matter, by writing to us and making the matter known.—ED.]

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Luminous Paint.—E. W. (*Sheffield*).—This useful invention—which, by the way, was first brought into general knowledge through the medium of the last great Paris Exposition—can be purchased through many agents. I give one in London: W. C. Horne, 6, Dowgate Hill, London, E.C. It is retailed at prices and in quantities within the reach of most people. Write the above for particulars, stating your requirements. If you are a regular WORK reader, you will find a description of method of preparing luminous paint on p. 556, Vol. III., No. 139. This I had from a good source, and its perusal will interest you, I think.—F. P.

Boot and Shoe Making.—ERGO.—Many letters are reaching us, asking when these articles commenced. You will find this information below. It is a pity, when series papers of this nature are set going in WORK, that readers and friends of the journal do not make a point of bringing the fact under the notice of strangers interested. It would do incalculable benefit to WORK if every subscriber would, for instance, acquaint his or her bootmaker of these articles from Mr. Greenfield's pen. If friends of WORK would adopt this simple and not costly plan, it would save us a mass of correspondence every day, and materially relieve the columns of "Shop." See Nos. 165, 168, 173, 176, 182, and 187.—ED.

Ebony Stain.—A. R. (*Ashton*).—Refer to "Ebony Stain" in WORK, No. 125, p. 332. The subject is there fully treated. The staining mediums you refer to do not turn the wood black. Their action is to simply darken such woods as mahogany or oak to give a richer appearance or the look of age. Look through the local directory for the address of dealers in pearl in your own neighbourhood. Should you be unable to meet with any, write Joseph Forrester, 1, Summer Hill Terrace, Birmingham; he can supply you in any quantity of genuine pearl. You may be aware that there is an imitation largely used. For this, write the British Xylonite Company, Homerton, London.—LIFEBOAT.

Spirit Varnish.—D. S. R. (*Cambuslang*).—A spirit varnish which, when simply applied by a brush or dipping, will give an appearance of French polish without any further trouble has yet to be found. Some preparation is needed, such as sealing the pores of the wood by "filling in," or giving a few rubbers of French polish. Papers on this subject are in the Editor's hands, and may, doubtless, appear in due time. Personally, I can meet with satisfactory results with a varnish made as follows: Rectified naphtha, 1 gallon; shellac, 2 lb.; gum benzoin, ½ lb.; gum sandarach, ½ lb.; gum thus, ½ lb.; resin, ¼ lb. The varnish you refer to as used by the Germans contains gum elemi, which gives a bright but very soft varnish, hence it is a gum but little used in this country.—LIFEBOAT.

Patent.—J. R. (*New Brompton*).—There is nothing new in your idea for the position of a portable light. Miners have carried their candles thus from time out of mind, and workmen in more delicate crafts—sculptors, for instance—used to do so when candles remained the only source of light. But to the use of gas in this manner, the fact that the necessary supply pipe would hamper the free movements of the worker has always been an obstacle; so also has the minor point that the heat generated by the burner might cause inconvenience. Are we to understand that you have invented an apparatus by which both these difficulties are overcome? If so, you have, undoubtedly, a proper subject for a patent; but whether such a patent would prove profitable is another question, and one which it is not possible to answer. It appears to us, however, that an electric light, with a small portable battery, would be better suited to the purpose than gas, if it could be produced at a sufficiently low price. As to the professional character of the patent agent named, or his charges, it is not for us to express an opinion; but if you wish to get your provisional protection economically, buy the form at the Post Office, and make out the specification yourself. You have full instructions how to proceed in WORK.—C. C. C.

Browning Gun Barrels.—J. L. (*Wexford*).—Brown stain, applied with a brush and allowed to dry on, is of no real service for these, owing to its liability to wear off with constant handling. The correct way, by eating into the surface by means of acids, though more tedious in its application, is far and away the best in the long run. The simplest method is to apply chloride of antimony, first made of a thin, creamy consistency by mixing with olive oil. The barrel should be slightly heated, the mixture applied, and allowed to remain on till the requisite brown is produced. The polish is brought up again by friction—rubbing with a piece of hard wood. Sometimes a coat of shellac varnish is now applied, and again polished. A more tedious affair, but adopted by some of the first-class establishments, and known as "military browning," is as follows: Tincture of steel, 7 oz.; spirits of nitre, 6 oz.; spirits of wine, 4 oz.; nitric acid, 2½ oz.; blue-stone, 1 oz.; rain-water, 24 oz. The blue-stone must be dissolved in the water first, the nitric acid put in last, and the whole well shaken, which will turn a nice green. The barrels must be perfectly free from grease. First day: Coat and stand in the drying room for the night; not less than 90° of heat. Boil off next morning; scratch off, and continue the same daily. You will find four or five coats sufficient. Change the water every morning (if possible, boil off in rain-water). *The barrels must be perfectly cold when coated.* Should you, on the score of cheapness, require a brown stain to apply with a brush, write us again; we shall be pleased to assist.—LIFEBOAT.

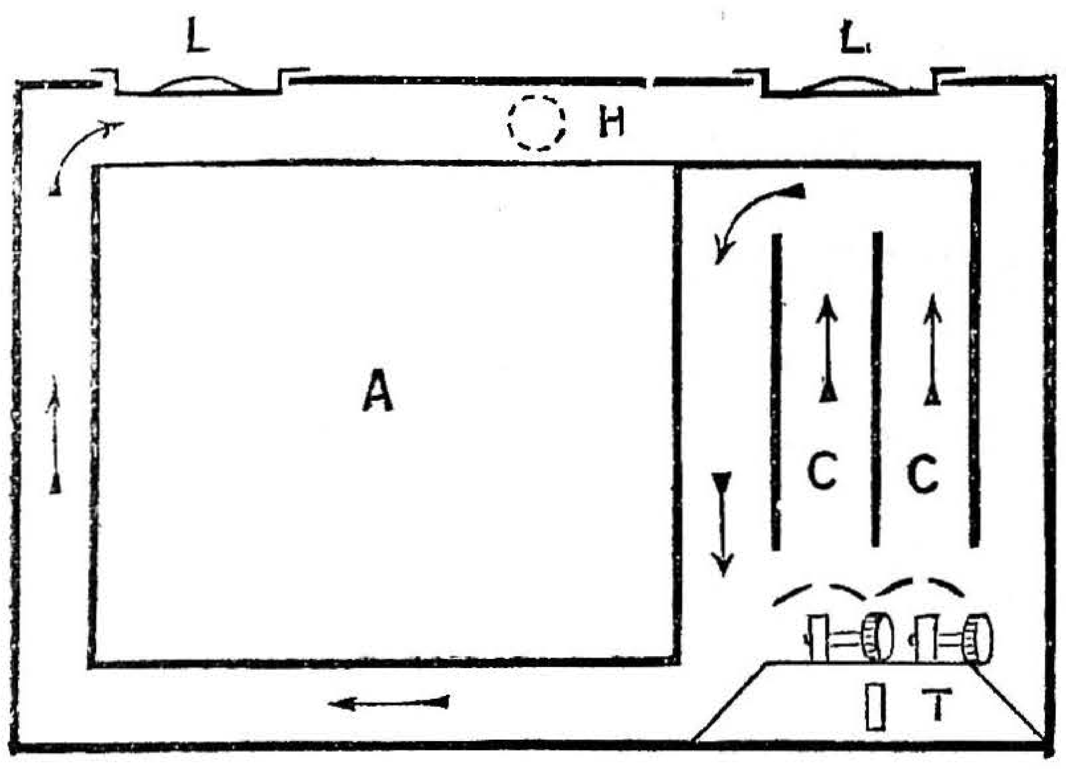
Turners' Company Competitions.—A. E. (*Birmingham*).—Write to the Clerk of the Company, London, E.C.

Mail-cart Wheels.—A. G. (*Pulborough*).—I have made several inquiries in London, and have come to the conclusion that, if I were wanting above, I should certainly send to Victor Cycle Co., Grimsby, for them; and advise you to do the same.—E. D.

Metal Beadings, etc.—A. L. W. (*Aberystwyth*).—I have made inquiries, and find that these ornamental mounts are chiefly imported. The only firm I have been able to discover who deals in them is S. M. McEwan, who deals in dyed woods, veneers, marqueterie, etc., 282, Old Street, St. Luke's, E.C.—B. A. B.

Aerated Waters.—H. G. (*Leith*).—Haywood & Tyler, Whitecross Street, E.C.; and Barnet & Forster, Forston Street, Shepherdess Walk, N., are both good makers; and will, no doubt, furnish you with all the particulars you require.—J. C. K.

Paraffin Cooking Stove.—D. J. S. (*Roehampton*).—Your idea and sketch for above are not at all bad, and would, if properly constructed, answer very well. I send you a sketch of a different design, which, perhaps, you may like better, being more compact and not so top-heavy. I see from your sketches that you understand what you want, so my explanations will only need to be brief. A is the oven, contained within an outer case, as suggested by you; T is the oil-tank, with two $4\frac{1}{2}$ in. burners, which you will find sufficient to heat a 12 in. square oven; C, C are the chimneys of same, but, instead of allowing the heat to disperse at the top in the usual way, stop it off so that it is directed in the course shown by the arrows. A few small holes

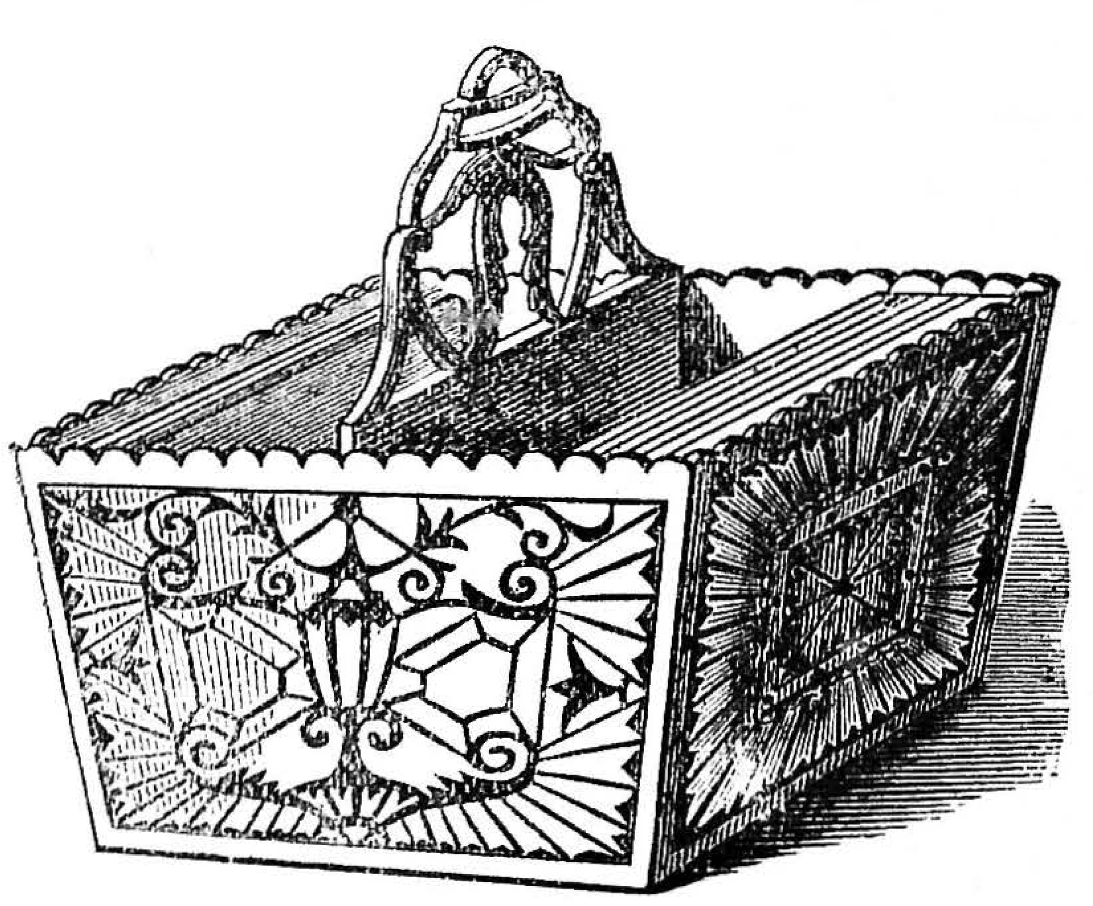


Plan of Paraffin Cooking Stove.

might be punched near the chimneys to help heat the right-hand hole of the top plate. A hole at H—to which you might rivet on a flange and about 2 ft. of 2 in. pipe—would assist in drawing the heat round. L, L are covers, which must be left there when the oven is in use without saucepans on the top. With regard to thickness of material, I advise you to use 24 gauge soft steel, which you can get at any ironmonger's. The sides will not require lagging if you stand the stove out of the reach of draughts. I am sorry that I cannot give you any advice respecting the making of a wooden dough-mixing machine to dispense with yeast. Perhaps some other contributor will oblige.—R. A.

Green-houses and Summer-houses.—DULL.—These are exempt from assessment. DULL and his brother should appeal.—OVERSEER.

Music Holder.—JAY TEE.—I hope that this design will suit you. Probably you do not need details of construction; if you do, however, let us know. With regard to your query respecting your desire to be supplied, on payment, with a full-sized drawing, I think I may say that you and other readers would experience little difficulty by making your wants known in WORK. I have several times been applied to, privately and through WORK and other journals, for full-sized (working) drawings of various pieces of furniture I have designed; and I daresay other contributors have had similar applications. In my case, however, I am generally too much occupied with original work to give much



Music Holder.

attention to these requests. But, in your case, if no reader comes forward with due willingness, I will undertake the job for you if you write me through the Editor, enclosing a stamped letter to me in one addressed to the Editor. Perhaps the Editor might see some utility in a suggestion I now make: That a department be started for supplying, at proper fees, working drawings of selected designs from WORK, any capable readers having their addresses retained for this purpose, to whom application may be made.—J. S.—[Before deciding this matter, I should like my readers' and contributors' views.—ED.]

Quarter Horse-power Engine.—E. C. (*St. John's Wood*).—Articles appeared in WORK, Nos. 106, 110, 121, 125, 131, 136, 141, 145, 149.

Coach-makers' Routers.—G. W. (*Devizes*).—I would advise you to buy your routers instead of making them. Send to Mr. George Buck, tool-maker, 242, Tottenham Court Road, London, from whom you could get routers and other coach-makers' tools.—W. P.

Cutting Machines.—G. A. M. (*Nottingham*).—I am sorry I have been unable to answer this query sooner, as I know of a machine which would just suit. It is called the "Advance," a small cutting machine, 16 in. knife. Full particulars can be had by applying to W. C. Horne, 2, White Horse Alley, Cowcross Street, London, E.C. If G. A. M. will do this, and mention where he got his information, I am sure he will be well suited.—G. C.

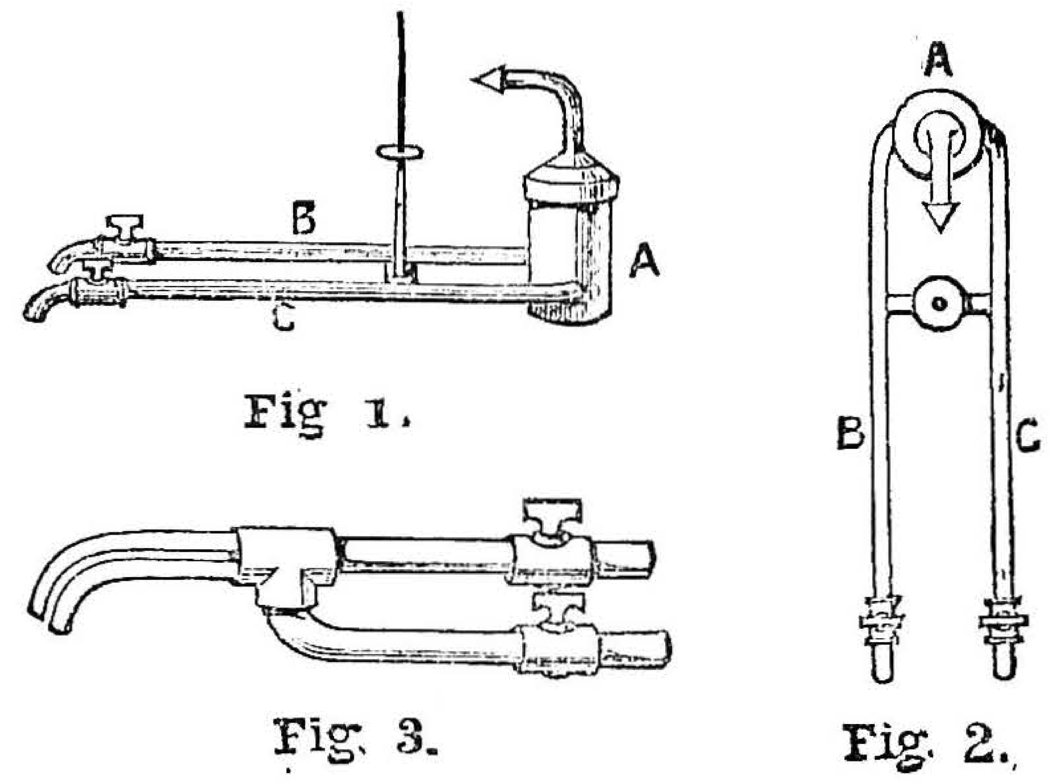
Leakage of Gas.—W. H. C. (*Homerton*).—In the first place, I should thoroughly examine the brackets and fittings to see if the leakage was in them; first, by carefully smelling, and then, if you are not quite sure, by means of a lighted match or candle, being particular about the joint behind the wooden block and the wall; twenty per cent. of gas escapes are found to be either in the fittings or at the joint of the fittings and pipe. Perhaps you only smell the escape when the gas is alight, which would almost go to prove that the defect is in the bracket somewhere between the tap and burner. Anyway, give the fittings a good testing before going further. If, after having done this, you do not discover it, you must trace the pipes from the various fittings up to the ceiling, or down to the floor, or whichever way they run, slitting the paper behind the pipe here and there, and carefully smelling every inch of pipe. Do not apply a light to the pipe covered with paper unless you feel almost sure you have found the exact position, and then only for a second, blowing it out directly it lights, to make sure you are right, and that the gas really does escape there. If you have still not found it, you must now take up the floor boards directly over the pipes (which, by the way, should be *screwed*, and not *nailed*, down), and carefully smell every possible inch of the pipes; and if you think you have found it, test it with a light, always bearing in mind never to apply a light recklessly to find an escape of gas; never attempt to discover a *large* escape of gas with a light, or in a room that has been shut up whilst the gas has been escaping some time; and do not apply a light to a *small* escape of gas if it is in such a position that it cannot be got at readily; and lastly, always be sure that the stop-cock at the meter works properly, so that you can have it turned off at once in the case of a mishap. You must continue in this way to examine thoroughly every piece of gas pipe in the house until you find it. But after examining the fittings and pipes that are not hidden, and before pulling the place to pieces, go to your "tell-tale," the gas meter: that will soon let you know if there is an escape or not, for it sometimes happens that someone has let the gas escape at the burner from some cause or other, and has omitted to mention it. Turn all the gas off in the house, and turn the stop-cock full on at the meter; watch the small hand at the top, or unit circle, of the index, and if in an hour or two the hand has not moved, you may know that there is no escape in the pipes between the meter and the taps on the fittings, and the leakage, if any, must be in the fittings when the burners are lit; but if the hand moves ever so little, you may know there is an escape somewhere, and be it ever so small find it out, for you must bear in mind that that small escape is continually going on, and comes to something considerable in a quarter. I think I have given you sufficient information to enable you to find the small escape you mention, and a little yellow soap rubbed in will stop it until you can do it properly with white-lead, or call in a gas-fitter.—E. D.

Blind.—FACTORY LAD.—Blind laths can be bought at most timber yards, especially those that have saw mills in connection. I do not know Manchester, but blind laths, ready planed, ought not to cost more than 12s. per 100 ft. super, which is less than ½d. per ft. run. This is for painted work; perfect laths, suitable for stained and varnished work, cost rather more. If you read the article on "Venetian Blinds" (No. 110, page 86, Vol. III. of WORK) you may get a hint or two. You cannot easily get paint off Venetian blinds, and probably if you did you would find the laths not clean enough to varnish; they are so frequently prepared with size colour. The colour used for green blinds is made of mineral green, turpentine, varnish, and white lead. It is not now so popular as it used to be, on account of the poisonous character of the colour, which, however, is too much imprisoned to do any harm. If you wish to use it you will do best to buy it ready mixed, under the title of varnish green; it costs about 1s. per lb., and is to be thinned with turps only. The colour may be made lighter by the addition of white lead, which must be mixed with turps *before* adding to the varnish green. The varnish is composed of resin, or partly of it, and sold as turpentine varnish.—B. A. B.

Resistance of Electric Lamps.—SOLDER.—The resistance of Edison-Swan electric lamps varies with the length and diameter of the carbon filaments. Even 16 c.-p. lamps may have a varying resistance of from 30 to 200 ohms. The hot resistance of a carbon filament may be put down as one-half of that of a cold filament. The voltage of current needed to properly light a lamp is generally marked in figures on the neck of each lamp. You will find a table of the safe carrying capacity of wires in the *Electrician*, "Electrical Trades Directory" for 1892, in my book on Induction Coils, and in WORK, No. 138, Vol. III., p. 541.—G. E. B.

Brass Files.—SOLDER.—The teeth of files for brass are cut finer than those for filing iron. Finely-cut files are sometimes named "brass files."—G. E. B.

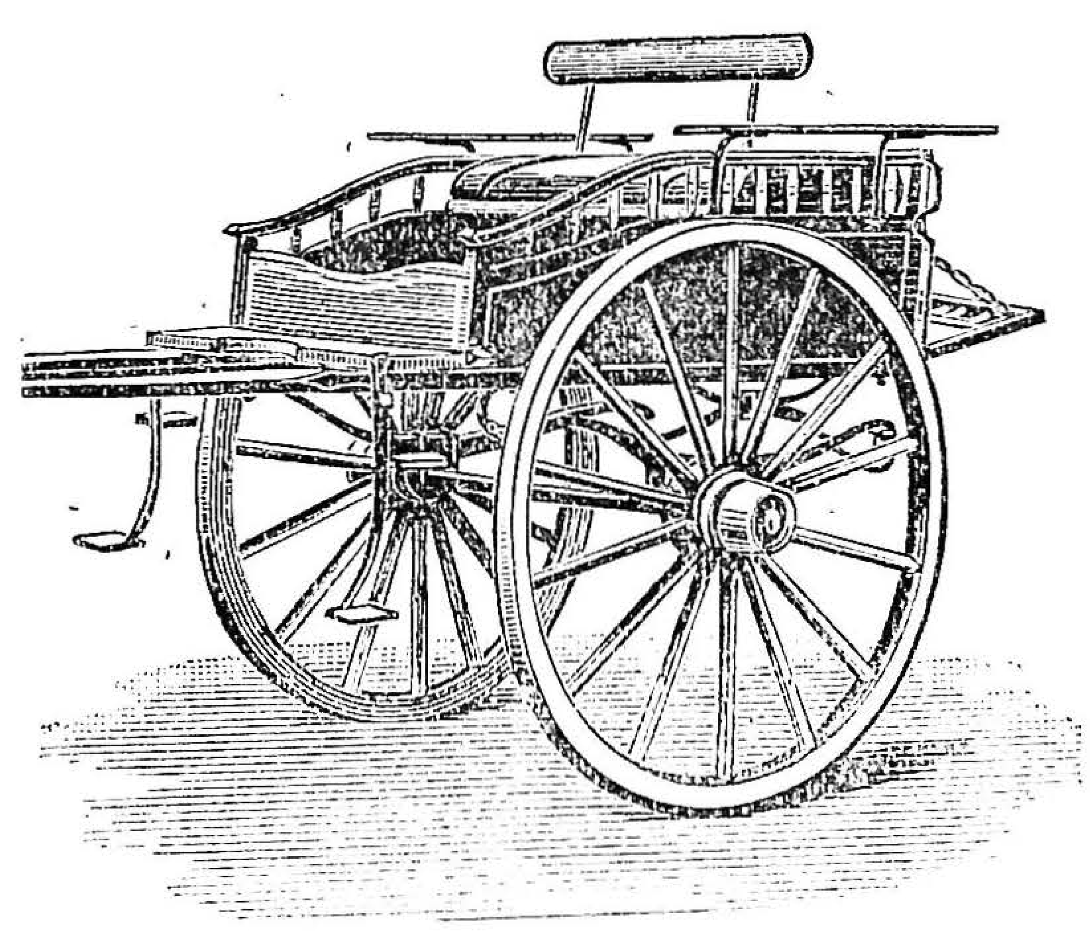
Oxyhydrogen Blowpipe.—C. R. (*West Kensington*).—You did not state in your letter whether you wanted the oxyhydrogen blowpipe for lantern or for brazing, etc. If the former, see the sketch Fig. 1. It consists of a reservoir, A, made from brass pipe of 1 in. diameter, 2 in. long, to which a circle of sheet brass is brazed to form a bottom. The upper part of the reservoir is packed with thin iron wires cut to a length of $1\frac{1}{4}$ in., and on top screws a cap fitted with a piece of bent ¼ in. tube, on which is screwed a nozzle having a fine bore. Two tubes of ¼ in. brass are fitted to the reservoir, and are bent



Figs. 1 and 2.—Oxyhydrogen Blowpipe for Lantern. Fig. 3.—Ditto for Brazing.

in such a way that they run parallel. These tubes are 10 in. long, and each one is fitted with a cock, so as to regulate the flow of the gases, and a bent tube is fitted to each cock. The arrangement for holding the lime is made to slide upon B and C. The safety of the blowpipe depends upon packing the reservoir well with iron wires, as these prevent the flame passing down the tubes and thus causing an explosion. The oxyhydrogen blowpipe for brazing is seen at Fig 3. I may say that, for this purpose, gas is almost always used in place of hydrogen. It is practically the same as the blowpipe shown at p. 250, No. 172, Vol. IV., but the brass pipe should not be more than ¼ in. internal diameter; the inner tube for oxygen about $\frac{1}{12}$ in. internal diameter, and should reach to the mouth of the outer tube. It can then be filed down, if required.—H. B. S.

Whitechapel Cart.—D. M. (*Aboyne*).—This question, "How to make a Whitechapel cart body, and hang it, so that, with four riders, those on back seat may sit upright, with sketch," involves two branches of cart making—body and carriage—with its ironwork details of proportional measurement of parts and adjustment to act properly. It would require as much as a whole number of WORK to explain all, even briefly, to do justice to your questions. In "Shop" columns you will find forthcoming replies bearing on the main aspect of your question in answer to other inquirers. To aid you is a sketch



Whitechapel Cart.

of a sticked Whitechapel cart body. The bottom sides are 3 in. by 2 in. for very light-framed body; the pillars, $1\frac{1}{2}$ in. thick; stiles between pillars, $1\frac{1}{2}$ in. square; side rails, 3 in. by $1\frac{1}{2}$ in. The seat, to shift back, may run on rollers let into four corners, and a pin of iron to pass through seat, each side, into holes in the projecting seat side-rails, on which the front seat moves. This should be 1 in. above the level of back seat, to slide over it. The hind riders sitting without stooping or being tilted back is a matter of shaft hanging. This will be explained in detail in a future number of WORK; but to guide you now, for a 15-hand horse, with 4 ft. 6 in. high wheels, be sure to have shafts that rise, from the horizontal level of body bottom to the tug-bearing, 16 in.; not a fraction less. And when your cart is mounted, and the shafts are held up to 4 ft. 2 in. at the tug without riders, the cart body will be about 4 in. lower in front than at the back. To look at it thus, it will show as no Whitechapel or any other cart in England looks; but carts are not used empty, as they are sold in coachmakers' shops (made to sell), but for use, with two, three, or four riders in them. Put in four riders, and the sinking down of the springs 4 in., and with them, the back ends of the shafts, brings the body to a true level and horizontal line of seats, so that hind riders sit so as to ride in comfort, without risk of being slid off into the road. The axle, fixed by scroll-irons as deep in front as behind, should be 24 in. forward of a vertical line of hind-bar.—J. C. K.

Camera Obscura.—R. F. (*South Hornsey*).—The lines upon which a camera obscura is constructed are remarkably simple, and consist of little else than a lens, a mirror, and a translucent screen, on which the image is thrown, all enclosed in a suitable box. If a permanent building is required, the screen is replaced by a whitened table, upon which the image reflected by the mirror is cast, the building itself constituting the box or camera; the lens and mirror are fixed in a small revolving turret, to which movement is given in a similar manner to that of an ordinary window-blind roller, except that the movement is horizontal instead of vertical, by means of cords conveniently placed inside the camera or dark room. This revolving movement is not absolutely necessary, but has the advantage of adding a pleasant variety to the picture. If the position of the camera is raised above the surrounding buildings, etc., a veritable panorama is then shown on the table with excellent effect. The table is an ordinary flat-topped table covered with white paper, or, what is better, coated with about half an inch thickness of plaster-of-Paris, made perfectly level and sand-papered to a smooth surface. It goes without saying that the room itself must be perfectly dark, no light being admitted except that passing through the lens to form the picture. Any good single achromatic lens will answer perfectly—one of long focus, as the image will then be of more important dimensions. The mirror must have a true surface, and if made of *thin* patent plate is preferable to the usual thick plate, which is apt to give blurred images; but glass silvered on the reflecting surface, such as the reversing mirror used for photographic purposes, is best of all.—E. D.

Horsehair Loom.—J. W. (*Dundee*).—"Spon's Encyclopedia," Part 18, price 2s., is chiefly devoted to the subject of hair manufacturers; perhaps this might be of service to J. W. Or possibly some reader of WORK can tell him about looms for horsehair weaving.—LIFEBOAT.

Electrical Engineering.—R. F. (*Hounslow*).—I see that R. F. wishes his son to qualify as an engineer and electrician. Now, there is but one way to qualify as an engineer, if you ever wish to be acknowledged as such by the Inst. C.E.; and that is, to serve articles of three or five years' duration under one of its members, for which a premium is and always has been paid of 500 or 300 guineas respectively. There are many members at the present day who make electricity a speciality, but I should be very sorry to be responsible for having given six or seven names that *I* thought were "solid and respectable;" the degree M.I.C.E. would be *carte blanche* for all that is required. As to subsequent employment after the term of articles, that always depends upon the conduct of the pupil himself during his apprenticeship; and I may add that it would certainly be his fault if he were sent adrift. But how your correspondent's son would get on with an injured *right* hand I fail to see, seeing that it is usual always to serve at least the first eighteen months in the drawing office. I am afraid he would find it a great detriment to tracing, drawing, etc., or even to taking out quantities.—J. B.

Cold Brazing.—FAITHFUL READER.—Here is a recipe for cold brazing:—Melt 10 dwt. of tin in a small crucible, and add in the following order, as the tin melts, bismuth 1 dwt., fine silver 8 dwt., platinum foil 1 dwt. When all is melted and mixed together, pour into a mould; reduce this to a powder, and reserve till required. To use the solder, prepare the article by cleaning and scraping the same as if for ordinary soldering; tin the surfaces to be united with the following flux: 1 part metallic sodium to 50 parts mercury; get this prepared by a chemist, and keep in a closely stoppered bottle. Mix three parts of the solder filings before mentioned with one part of mercury till reduced to a paste; smear it on the surfaces to be united, and press firmly together; it will soon set hard. This method is only suitable for articles that cannot be brazed with a fire, and will not stand much knocking about.—R. A.

Birdcage Making.—CANARY.—I do not know of a book published on birdcage making. There are many books on cage-birds and how to keep them. If CANARY will get Nos. 54 and 108 of WORK, I think he will find all he wants.—F. H. —[A novelty in this way will shortly appear.—ED.]

Twisted Pillar.—C. B. B. (*Westbury-on-Trym*).—To answer this would be to advertise a particular turner, and I am quite ignorant of Bristol turners, any of whom ought to be able to do the work mentioned. C. B. B. should ask the turner who usually does his turning, as he, being a cabinet-maker, must often need turning work done. Not having full particulars, no instructions can be given as to the twisted pillar required; but twisted work may be described as carving on the lathe, and after the ordinary turned parts are done, and the twisted parts turned to a cylindrical form, a piece of paper, like a riband, may be twisted round the work at the proper inclination and the spaces cut with a saw; then gouge, rasp, and glass-paper, using the lathe with a backward and forward movement, with a very slight movement of treadle and fly-wheel.—B. A. B.

III.—QUESTIONS SUBMITTED TO READERS.

*** *The attention and co-operation of readers of* WORK *are invited for this section of "Shop."*

Dough-mixing Machine.—HYGIENE writes:—"Would a fellow-reader describe a wooden dough-mixing machine that would incorporate the air, to make bread without yeast, soda, etc.? It should be for hand power, and for a quantity of 1 lb. or 2 lb. at a time."

Piano Stool Screw.—W. J. W. (*Heckmondwike*) writes:—"Will any reader kindly tell me where I can obtain Brooke's Patent Adjustable Screw for pianoforte stool? I have seen one which came from Germany."

Insurance of Tools. — CONSTANT READER writes:—"Could any subscriber inform me as to insurance of wood-workers' tools' offices, and terms?"

Blade Polishing.—ELECTRO writes:—"Would some kind reader inform me how to polish pocket-knife blades, and especially how to make buffs for the polishing lathe? I use fine emery, also putty powder with oxalic acid, and it does fairly well."

Monogram.—E. W. B. (*Manchester*) writes:—"I shall be greatly obliged if some kind reader would furnish me with a monogram of the letters 'E. W. B.'"

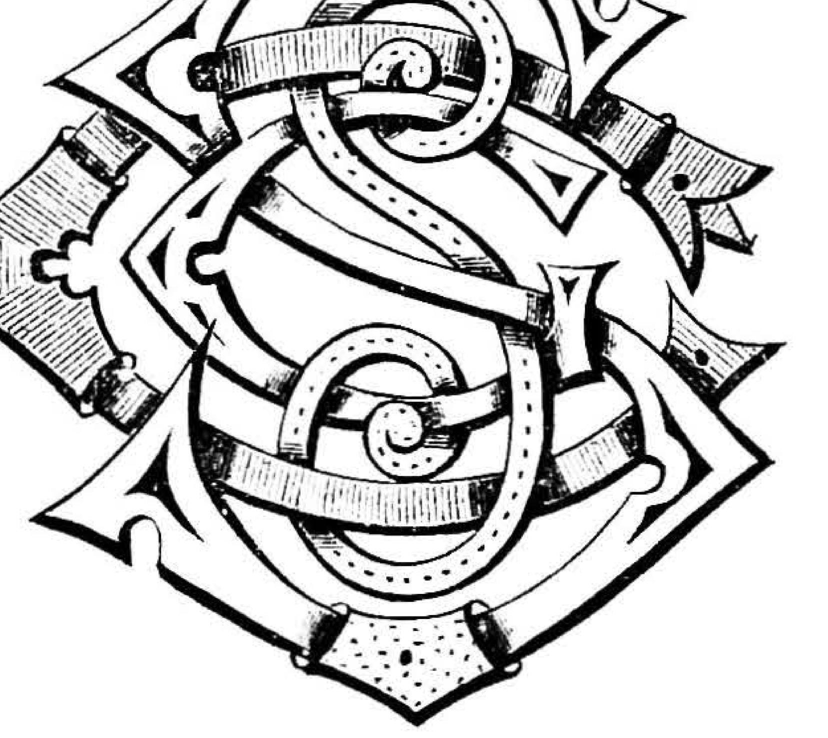
Furniture Diagrams.—E. C. N. (*Islington*) writes:—"Can any kind reader kindly guide me to a work on diagrams and measurements of furniture?"

Enamel for Lathe.—E. J. C. (*Charlton, S.E.*) writes:—"Will some reader tell me where to purchase good black enamel for lathe—one that will not dissolve with oil?"

Monogram.—J. H. P. (*Castlemartin*) writes:—"I should be much obliged if some reader would give me the monogram 'J. H. P.' in a form suitable for carving in wood in the centre of a stool."

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Monogram.—T. B. P. (*Winlaton*) writes:—"I beg to submit monogram, 'S. S. G. C.,' in answer to



"S. S. G. C." Monogram.

H. T. W. (*Cardiff*). (See No. 170, p. 222). Should this design not suit H. T. W., I shall be pleased to design another."

Asphalte Paths.—W. W. W. (*Wembley*) writes to W. R. (*St. Albans*):—"Ashes with pitch and tar do not do so well as coarse gravel. The usual method, after preparing the path and making it the proper rounded shape to allow the wet to run off, is to boil up gas tar with a little pitch in it in a large iron pot, and then mix the fine chippings that are sold for paths, or good gravel will do, with the hot tar and spread on the path to, say, 2 in. thick or more; then roll flat and sand it slightly to keep the roller from sticking. Care must be taken that the contents of pot do not catch fire. If they do, the only way to put it out is to cover top of pot with a slate or something that will do this as quickly as possible, and same may be kept handy in case of need."

Pyrotechny.—M. (*Bishop Auckland*) writes to C. A. J. (*Manchester*) (see No. 183, p. 430):—"You will find 'Firework Making for Amateurs,' by Upcott Gill, 170, Strand, a suitable book."

Ventriloquists' Dolls.—W. C. (52, *Commercial Road, Peckham*) writes to BURGY:—"I can supply him with the dolls he requires. The price would be 30s. the pair."

V.—LETTERS RECEIVED.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—J. B. (*Old Charlton*); J. T. S. (*Strangeways*); W. L. (*Middlesboro'*); T. S. A. (*Grantham*); CEMENT; J. H. W. (*Hulme*); W. C. (*Heckmondwike*); C. C. (*Durham County*); YOUNG ENGINEER; A. A. (*Christchurch*); E. McC. (*Newcastle*); L. W. L. (*Newcastle-on-Tyne*); W. T. H. (*Paddington*); T. H. (*Blackburn*); G. S. (*Montreal, Canada*); D. McS. (*Glasgow*); H. J. O. (*Stockport*); D. C. (*Godalming*); J. P. R. (*Aberdeen*); A. R. (*Scorrier*); W. S. K. (*Tunbridge Wells*); W. P. (*Cheshire*); W. H. C. (*Plumstead*); F. H. (*Hull*); J. E. B. (*Chesterton*); WHITESMITH; BOOTS; PRACTICAL; H. D. (*Leeds*); J. H. (*Stockton-on-Tees*); CONSTANT READER; A. W. J. (*Evesham*) J. K. (*Newcastle*); T. W. L.; F. W. B. (*Huddersfield*); LEYBOR; T. E. (*Creeton, N.B.*); REV. R. B. R. (*Dorchester*); J. F. S. (*Salop*); D. B. C. (*Bedford Park*); C. W. (*Conway*); CONSTANT READER (*Penzance*); W. R. (*Tunbridge Wells*); X. Y. Z. (*Derby*); YOUNG SAWYER; C. R. (*Nottingham*); X. X. (*Dundee*); J. H. (*Wellington*); LAVENDER; W. W. (*Brierly Hill*); G. R. T. (*Newcastle-on-Tyne*); W. H. B. (*West Hartlepool*); J. M. (*Belfast*); J. M. (*Glasgow*); F. R. (*Isle of Wight*); M. L. (*Naples*); C. F. M. (*Bolton*); TENANT.

"WORK" PRIZE SCHEME.
FIFTH COMPETITION.

CONTINUING our scheme of Prize Competitions of a useful and practical nature, we propose to devote the present one to the subject of Electricity, in which our readers and the world at large take so keen an interest. We invite competition for the following prizes—

First Prize, £3;
Second Prize, £2;
Third Prize, £1;

for the three best suggestions of an original and practical nature, involving the application of electricity to some domestic, commercial, or scientific use. This application may be on a large or small scale, to take effect on land, sea, or in air—the main conditions being the newness and practical possibilities of the suggestion.

All manuscripts intended for the "Electricity Suggestion" Competition must be addressed to the Editor of WORK, c/o Cassell & Co., Ld., Ludgate Hill, London, E.C. They must reach him on or before Saturday, December 17th, endorsed, "Electricity Suggestion" Competition.

*** For conditions and rules see previous numbers.